FEBRUARY 1956 - Sixty-second Year

## MACHINERY

#### **BLISS transfer feed presses** for refrigerator production

At General Electric's Appliance Park, this 700-ton transfer feed press and two 800-tonners like it produce all the pans and shelves GE needs for its annual output of more than a half-million refrigerators. And it's all automatic—

Strip feeds off coil cradles through straighteners and into the presses where transfer fingers guide it through. The 700-ton press turns out ten deepdrawn pans a minute; the two 800-tonners turn out 15 shelves per minute.

How about your long run press work? Isn't it likely that Bliss' long experience in this field might offer the answer to your problem?

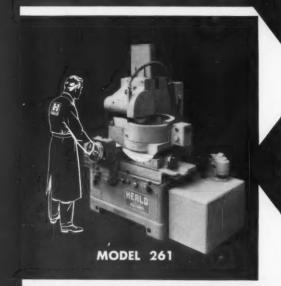
E. W. BLISS COMPANY

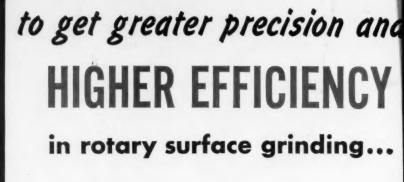
Canton, Ohio

BLISS

is more than a name...it's a guarantee

# 3 WAYS New MODEL 161





#### SMALL SIZE WORK

This compact, low-cost machine with 6" magnetic chuck grinds flat, concave or convex surfaces to extremely low microinch finish. Features include rigid, column type construction, manual or power reciprocation, simple mechanical reversal, "right-hand" operation and powerful direct-drive wheelhead. For complete information, send for Bulletin 1-161.

#### MEDIUM SIZE WORK

Available with 12" or 16" rotating chuck, this heavy-duty machine does high precision surface grinding on a wide range of small to medium-size work. Smooth, hydraulic operation of wheelslide and table reciprocation can be arranged for manual or fully automatic control. Vertical column construction places wheel pressure directly over table ways for maximum rigidity of support. Grinds flat, convex or concave surfaces. Bulletin 1-261 gives complete details.

#### LARGE SIZE WORK

A massive, heavy-duty machine with 24" rotating chuck for precision grinding of flat, convex or concave surfaces on large, heavy work. Available with either manual or fully automatic control. Heavy, rugged base and column construction, with smooth, infinitely variable hydraulic feeds, assures freedom from chatter and vibration. Hydraulic power unit with multiple pump system provides separate lubrication pressure and operating pressure. For further details, send for Bulletin 2-361-M.

Three more reasons why IT PAYS TO COME TO HEALD.



THE HEALD MA

Subsidiary of The Cincinnati Milling Machine Co.

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Editorial, Advertising and
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Associate Editors
FREEMAN C. DUSTON
CHARLES H. WICK
EDGAR ALTHOLZ

Assistant Editor
RAYMOND H. SPIOTTA

Book Editor HOLBROOK L. HORTON

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ROBERT B. LUCHARS
President

EDGAR A. BECKER Vice-President and Treasurer

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DWIGHT COOK
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GEORGE H. BUEHLER 228 N. LaSalle St., Chicago 1, III.

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RICHARD E. HOIERMAN 2831 El Capitan St., Dallas 28, Tex.

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French Address
LA MACHINE MODERNE
15, Rue Bleue
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## MACHINERY

Volume 62

FEBRUARY, 1956

NUMBER 6

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

Diversified Machining Methods Shape Jet-Engine Blades

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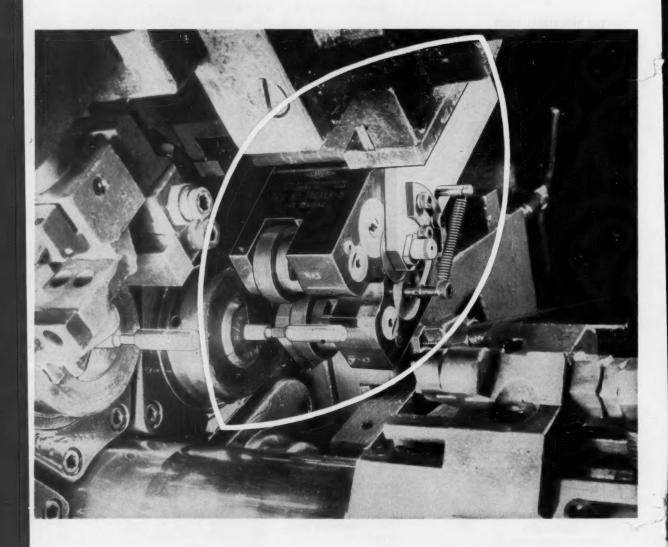
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## Over 1,100,000 threads

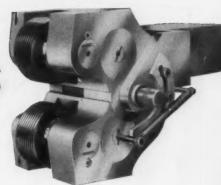


THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

espirite to the second of the continue

# with

## set of Rolls



The economy of LANDIS Thread Rolling Attachments due to long roll life is being demonstrated in the production of studs at the M & S Morenci Corporation in Morenci, Michigan.

#10-32 pitch NF threads, .350" long, are rolled on 1020 screw stock using a #14 GA LANROLL Attachment on a 9/16" Acme-Gridley Automatic. The Attachment is operated in the 4th position, rolling next to the collet .030" back of the shoulder, and threads are held to  $\pm$ .00025" of the pitch diameter. 1,100,000 threads have been produced to date with the original set of roll dies. Another Lanroll Attachment later placed in operation on the same job has to date produced 500,000 threads with its original rolls.

This long roll life is a result of the basic design of the Lanroll Attachment incorporating patented new principles. A degree of stabilization never before obtained in a tool of this type is ensured between the workpiece and the attachment. Open construction allows the use of thread rolls of the maximum diameter, distributing wear over an increased area. The accuracy and wear-resistance of the rolls themselves is the result of more than 50 years experience in the manufacture of threading tools. These rolls are precision-ground to produce uniform, accurate threads of the highest quality.

LANROLL Attachments are made in five sizes for use on bar automatics and turret lathes to roll both fine and coarse pitch threads to Class 4 tolerances. Quick and easy set-up changes assure operation of the attachment for every size within its range as though it were exclusively engineered for the particular work being threaded. The M & S operation shown here is an example of this set-up simplicity. Using only the handbook furnished with the Attachment, a satisfactory production set-up was made by a set-up man with no previous thread-rolling experience.

For more detailed information on construction and many exclusive features, send specifications and ask for Bulletin G-96.

These
THREADING
TOOLS
displayed
at Booth 578
ASTE Show

#### LANDIS Machine COMPANY

WAYNESBORO . PENNSYLVANIA . U.S.A.

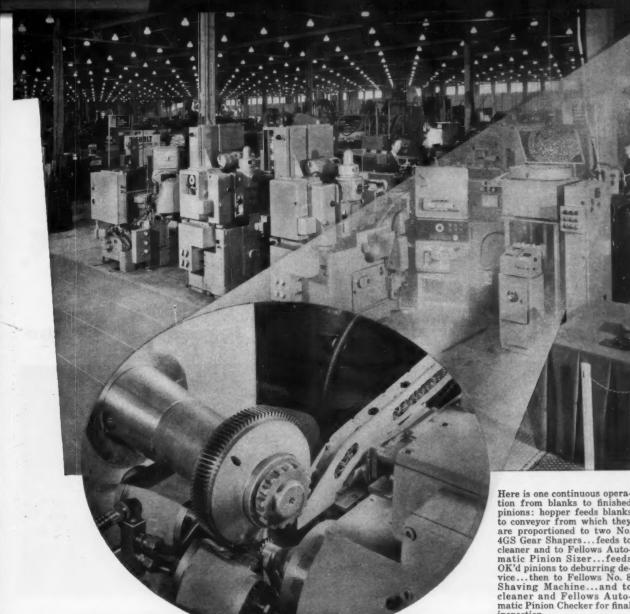
AT THE NMTB SHOW, as in actual plant application...the Fellows Transfer Line introduced brand new concepts in automatic work handling with integrated cutting, shaving and inspection of precision pinions...completely untouched by human hands.

the spotlight is on simultaneous shaving and

on the Fellows

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THE PRECISION LINE



chamfering

No. 8 "Full-Tool" Shaving Machine

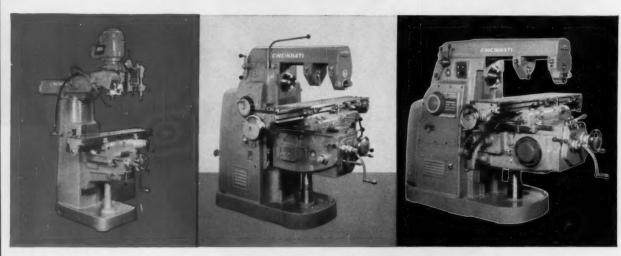
Here is one continuous opera-Here is one continuous opera-tion from blanks to finished pinions: hopper feeds blanks to conveyor from which they are proportioned to two No. 4GS Gear Shapers...feeds to cleaner and to Fellows Auto-matic Pinion Sizer...feeds OK'd pinions to deburring de-vice...then to Fellows No. 8 Shaving Machine...and to cleaner and Fellows Auto-matic Pinion Checker for final inspection.

If you have need of long production runs on duplicate gears or pinions a Fellows Sales Engineer will be glad to work out with you any degree of automatic operation re-

FELLOWS Gear Production Equipment

# Forecast

#### Your costs will be lower with these



#### New CINCINNATI Contourmaster Tool and Die Millers

have all the features and characteristics so desirable for low-cost die sinking operations. The table is manually controlled. For die sinking, vertical movements of the cutter head are automatically controlled through the Automatic Hydraulic Depth Unit. Table traverse, 16" or 22"; cross traverse, 10"; spindle drive, 1 hp. Want more information? Complete specifications may be obtained by writing for catalog No. M-1919.

#### New CINCINNATI Nos. 2ML and 2MI Milling Machines

New features which will reduce costs in your shop include auxiliary motor for feed drive (full hp of main drive motor transmitted to the spindle); cutting fluid pump now individually motor driven; filters relocated for easier accessibility. Automatic Table Cycles, available for Plain and Vertical Machines, include Automatic Backlash Eliminator. Automatic Spindle Stop available for Automatic Cycle Machines. For more details ask for publication No. M-1916.

#### New CINCINNATI Dial Type Milling Machines

are heavier and more powerful than ever before. All sizes (Nos. 2, 3, 4) are available in Plain, Universal and Vertical styles. All are equipped with Automatic Backlash Eliminator; motor driven cutting fluid pump; feed drive motor mounted on the knee; pushbutton spindle speed change and spindle start-stop. Plain and Vertical Machines are available with or without Automatic Table Feed Cycles. Catalog No. M-1915.

#### MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING

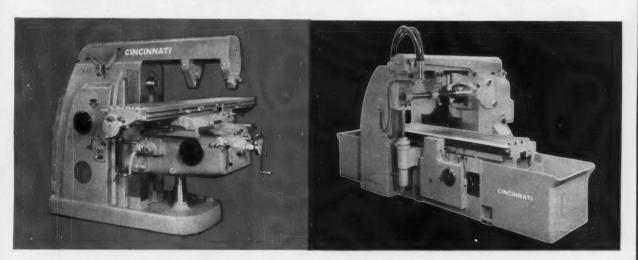


## '56

The forecast that concerns you most this year—cost of production in your shop—can be accurately determined by comparing your present metalworking equipment with the newest available. Take a long close look at your milling machines, for example, and compare them with new Cincinnatis. You'll be agreeably surprised at the big savings you can make in cost of production . . . closer precision . . . reduced maintenance charges. Replace now with new Cincinnati Milling Machines, and you can forecast a much better year for your business. ¶ Of course, Cincinnati builds many more standard milling machines than those illustrated here . . . actually 293 sizes, types and styles. And in addition, five cutter and toolroom grinders. For brief specifications look in the latest issue of Sweet's Machine Tool File, or write us for literature. No obligation.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

#### NEW Cincinnati Millers in your shop



New CINCINNATI High Power and Dual Power Dial Type Milling Machines

are unquestionably the heavyweight champions among knee-type milling machines. Now, the full power of the main drive motor (up to 50 hp) is transmitted to the spindle; a 5 hp motor takes care of feed and rapid traverse requirements. One lever selects 24 spindle speeds and 32 feeds; one lever engages table feed and rapid traverse; a small lever on the knee engages the spindle clutch; Dynapoise overarm smooths out the cutting action; automatic backlash eliminator on table feed screw included with standard equipment. Built in Nos. 3, 4, 5 and 6 sizes. More information in catalog No. M-1917.

New CINCINNATI Tracer Controlled HyPowermatic Milling Machines

are built in Plain and Duplex styles and 42 sizes of each from 36" to 168" table traverse; up to 50 hp spindle drive and separate 5 hp feed drive. They combine heavy duty tracer controlled milling with all the conventional milling operations assignable to Plain and Duplex HyPowermatics. Simple sheet metal templates are attached to the fixture or table. Profiles having curvatures and straight lines at angles up to 80° from the horizontal can be accurately milled. Want complete specs? Ask for catalog No. M-1909.

## CINCINNATI

MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

# These ENTIRELY VAN NORMAN No. 16 DO THE WORK OF TWO Save Equipment Dollars

These new Van Norman Ram Type Millers are designed to increase your milling production and reduce milling costs. Entirely new from top to bottom, they are engineered for maximum rigidity, cutability and accuracy.

A single investment in any one of these millers gives you the equivalent of two single purpose machines plus attachments at the much lower cost of a single machine.

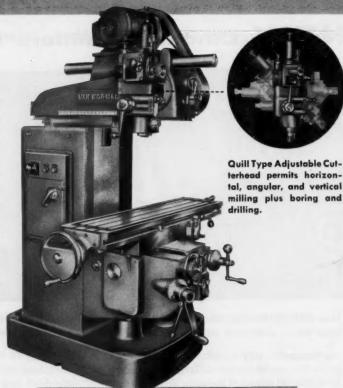
They are available in both plain and universal models.

Write for complete details today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy.

For instance — you can purchase a No. 16S on a 5 year conditional sales contract for only \$4.98 per day. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export



NO. 165

features the quill type adjustable cutterhead that makes this machine the most versatile miller available. Table:  $40\frac{1}{2}$ " x 10"; Quill Travel: 4"; Quill Power Feeds: .0015; .003; .006; Cutterhead Spindle Motor: 2 HP.

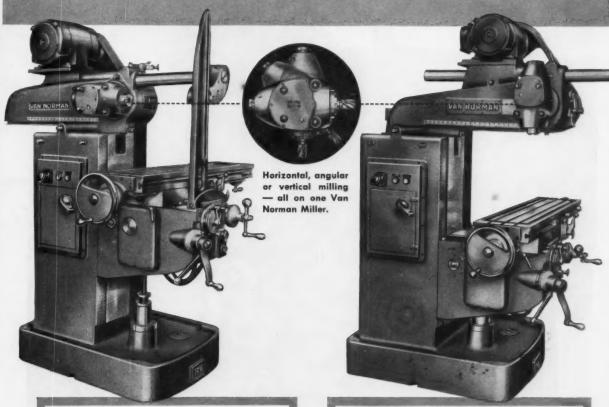
#### **VAN NORMAN MACHINE**

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

NEW...

## RAM TYPE MILLERS SINGLE PURPOSE MACHINES

... Cut Production Costs!



NO. 16M

a heavy duty, rugged miller designed for maximum rigidity and accuracy. Table: 40½″ x 10″; Ram Travel: 20½″; 3 HP Cutterhead Spindle Motor.

NO. 16L

designed to increase production and cut costs in tool rooms, machine shops, pattern shops and production lines. Table 40½" x 10"; Ram Travel: 20½"; Cutterhead Spindle Motor: 2 HP.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-9

#### Automatically centerless grinds four diameters

Landis design and tooling solves unusual grinding problem...

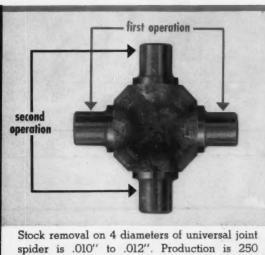


## LANDIS

precision grinders

#### and adjacent radii in one loading

at lower cost per unit

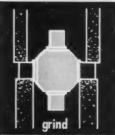


sequence of operation\*

Carrier picks up workpiece, moves it to grinding position.

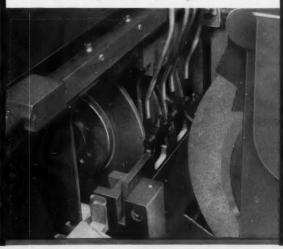


Automatic infeed grinding cycle grinds two diameters and adjacent radii.



Carrier loading universal joint spiders.

complete pieces per hour.



Carrier removes workpiece, indexes piece and moves it to second grinding position.



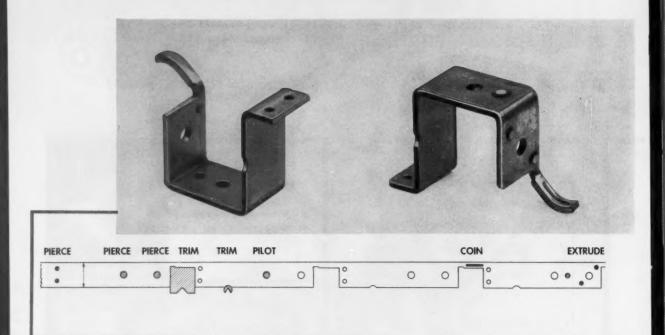
Automatic infeed grinding cycle grinds other two diameters and adjacent radii. Workpiece is automatically discharged.



\*Only one spider is shown in simplified work sketches, but machine actually handles two workpieces simultaneously. This is an example of how Landis designers can apply unusual tooling for the practical solution of grinding problems.

LANDIS TOOL COMPANY

WAYNESBORO, PENNSYLVANIA

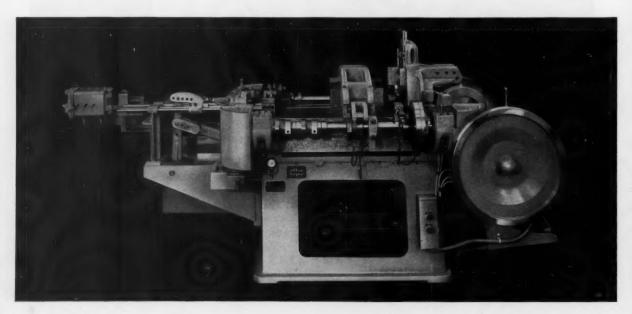


#### SEQUENCE STRIP SHOWS OPERATIONS PERFORMED

The drawing above shows the sequence of operations performed in the U. S. Multi-Slide to produce the automotive component illustrated at the top. Piercing, trimming, coining, extruding, cutting-off and two-level forming are performed, and the part is produced complete, without secondary handlings.

#### THE NO. 33 U. S. MULTI-SLIDE

Below is shown the basic No. 33 U. S. Multi-Slide which is used (with appropriate tooling) to produce the automotive component illustrated.



## MULTIPLE OPERATIONS ON U. S. MULTI-SLIDES® MULTIPLY PROFITS



Each secondary operation eliminated means reduced piece part costs. You, like all other manufacturers, are striving to attain this end result. In the production of formed metal stampings from coil stock, the U. S. Multi-Slide may be the answer.

U. S. Multi-Slides are designed primarily for the automatic production of precision formed stampings from coil stock. Many different types of stampings ordinarily requiring secondary handlings can be produced complete on the Multi-Slide.

The part illustrated on these pages is a component for an automotive manufacturer and is produced complete without secondary handlings. The sequence of operations is pierce, trim, coin, extrude, cut off and form (2 levels). This automotive component is just one of many different types of stampings which can be produced complete on the U. S. Multi-Slide.

If stampings are included in your production program, why not ask for a copy of Bulletin 15M illustrating and describing the four sizes of U. S. Multi-Slides we now build.

#### TWO-LEVEL FORMING

A two-level forming position is used to produce the automotive component. The top view, above, shows the preform obtained in the upper level, and the lower view shows the finished form obtained in the second or lower-level forming position.

#### U.S. TOOL COMPANY, Inc.

AMPERE (Fact Orange) NEW JERSEY

Builders of U. S. Multi-Slides - U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

## LOOK TO THIS NEW, PRODUCTION-BOOSTING LINE

NIAGARA

SC2-300-60-48

50 THROUGH 300-TON CAPACITIES



America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Worl

## For a realistic answer to the metal stamping and forming problems of today... and tomorrow

#### DESIGN MODERNIZATION CONCEALS DRIVING MECHANISM

Fully streamlined, enclosed construction, front and back, provides pronounced advantages. There are no exposed, overhanging flywheel, clutch, brake, intermediate shaft, nor motor in rear of press to obstruct crane service, block light, throw grease and consume floor space unnecessarily ... yet all parts are quickly accessible.

#### WORK-SAVING FLEXIBILITY MEETS SHIFTING PRODUCTION NEEDS

Box type welded steel slides are power adjusted through self-locking, worm driven, barrel type connections to accommodate a wide range of die heights and to permit quicker, easier and safer die setting. Niagara electric clutch control provides trouble-free push button operation and a five-position selector switch for ease, safety and efficiency in single stroking, continuous running, jogging, reverse jogging and slide adjustment.

#### RUGGED, HEAVY DUTY FRAMES PROLONG DIE LIFE

All-steel, rigidly constructed frames, featuring an exclusive triple box section design, provide maximum resistance to deflection from horizontal, diagonal and torsional stresses. Greater accuracy and longer die life are thereby assured,

#### GREAT SHUT HEIGHT AND LONG SLIDE ADJUSTMENT

Unusually liberal shut height and extremely long slide adjustment, of both one and four-piece frame construction, permit use of a tremendous range of stamping and forming dies. Hailed as the most progressive step in straight side, double crank press history, the new Niagara SC-2 Press Series could only have originated from a keen insight of today's metal working problems and the more challenging ones of tomorrow. In every detail of design, you'll recognize the unduplicated competence of Niagara engineers. Who else would be more mindful of press users' needs than the men who design and build America's leading and most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work?



#### CHECK THE FEATURE-BY-FEATURE EVIDENCE

Preview this complete new line of straight side presses at once. Find out what they can do for you. Write for Niagara's new, illustrated Bulletin 64-H today.

#### NIAGARA MACHINE & TOOL WORKS BUFFALO 11, N. Y.

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STRAIGHT SIDE DOUBLE CRANK PRESSES







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- 3. Precision chip-driver contours
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To Users of Metal Cutting Tools:

Our laboratories at Rochester have tested and proven many ways to lengthen tool life. Our research files may have the answer to your metal cutting problem.

> National Twist Drille are now available with carbide tips.

## National

NATIONAL TWIST DRILL

AND TOOL COMPANY

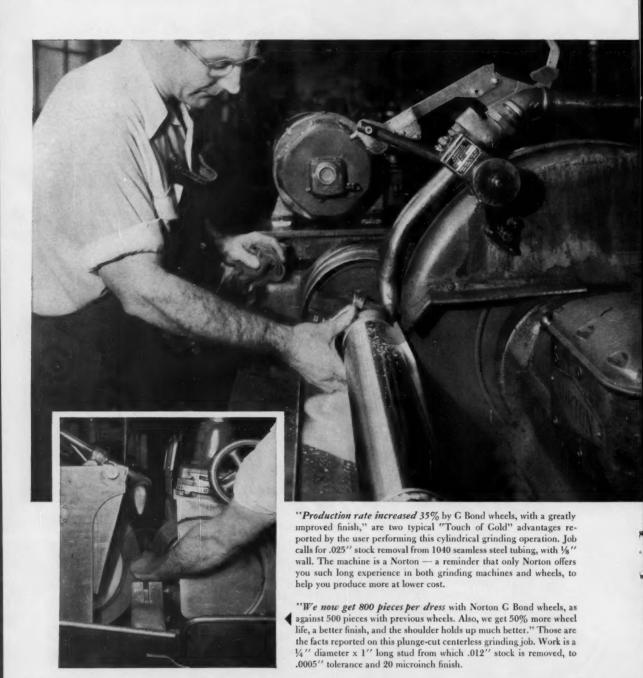
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CALL YOUR NATIONAL DISTRIBUTOR On-the-job photos ... on-the-job facts ... show

## Norton G Bond wheels setting new economy records in O. D. grinding



18-MACHINERY, February, 1956

## Users tell how "TOUCH of GOLD" performance boosts production rate, product quality and profits

In many years, nothing has done as much to raise the standards of precision and semi-precision grinding as Norton G Bond wheels. In the field of O.D. grinding, for example, users all over the country report that these greatly advanced wheels have given them an entirely new slant on the profit-possibilities of their centerless and cylindrical grinding jobs.

Here we can illustrate and quote only a bare minimum of the very many enthusiastic endorsements that are pouring in. But you could sum them all up in this sentence: "G Bond wheels grind faster, finish better, last longer and save us money on every job."

The reason is, the Norton G Bond is by far the most efficient vitrified bond ever developed. Wheels made with it outperform all others of this type, with "Touch of Gold" advantages like these:

Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on crushing roll.

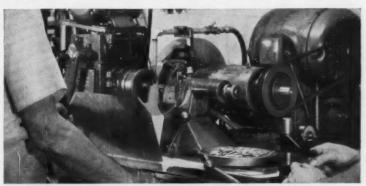
#### See your Norton distributor

for proof of how G Bond wheels can help improve your products and cut your production costs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products... to make your products better



"G Bond wheels last up to 40% longer," reports this centerless grinding customer. The piece is a vanadium alloy steel spindle ½" diameter x 10" long, with a tapered shank — ground in a plunge cut which removes an average of .045". With G Bond they found that wheel life increased 30% to 40% because this greatly improved vitrified bond breaks down evenly.



"100% better finish" is just one of the advantages listed by this user who switched to G Bond wheels for cylindrical grinding of small diameter stock. And besides improvement in product quality, this firm reports 50% more pieces per dress, with the last piece ground before dressing showing every bit as good a finish as the first piece ground after dress — additional G Bond benefits adding up to "Touch of Gold" performance.



W-1606

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories

8EHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

## Only Kearney & Trecker has

New # Series milling machines give you broad and equal distribution of all work loads... prolonged accuracy at critical points...unmatchable rigidity under heavy cuts



TF Series Model 210 Plain Milling Machine

POWER — 10hp spindle drive; 3hp feed and rapid traverse drive TABLE WORKING SURFACE — 62" x 14" FEEDS — (32) % to 90 ipm SPEEDS — (24) 15 to 1500 rpm WEIGHT — 9200 lbs. KEARNEY & TRECKER's new line of TF Series Plain, Universal and Vertical milling machines gives you a combination of more profit-making design and operating features than any other knee-type milling machines on the market today.

Among these features is the exclusive Kearney & Trecker Twin Screw knee design—a double support arrangement that distributes most effectively the weight of much larger, heavier knees, saddles and tables. This balanced design substantially increases stability under the heaviest loads... offers greater resistance to torsional thrust under all cuts... divides the wear factor in half thus assuring greater, longer-lasting accuracy.

The new feature-packed TF Series line of general production

The new feature-packed TF Series line of general production milling machines is available in five sizes — No. 2 to No. 6 from 10hp to 50hp. For the complete story on what these new can do for you, call your nearest Kearney & Trecker representative, or write to Kearney & Trecker Corp., Milwaukee 14, Wis.

#### 5 more reasons why of Series milling machines are way out front in rigidity



Heavier, Wider, One-Piece Knee — The Twin Screw arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . longer-lasting accuracy.



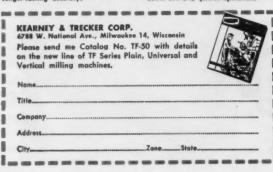
Three-Bearing Spindle—Complete assembly consists of three heavy-duty bearings, fly-wheel, train of widefaced lorged steel gears. Rigidity of spindle unit contributes to increased cutter life and quieter operation.



Double "Vibra-Void" Overarms—Two solid steel bars, mounted completely through column, vold vibration at source, afford more rigidity and resistance to deflection. Design also greatly simplifies changing of arbors and cutters.



"Fron-Trol" Operating Convenience— Front-mounted controls include feed selection, Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, table handwheel, levers for saddle clamping gib and backlash eliminator. All are grouped up front for easy operation. All machines are equipped with heavyduty (2" dia.) table feed screw.





Massive Column — Solid back, doublebox section calumn is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

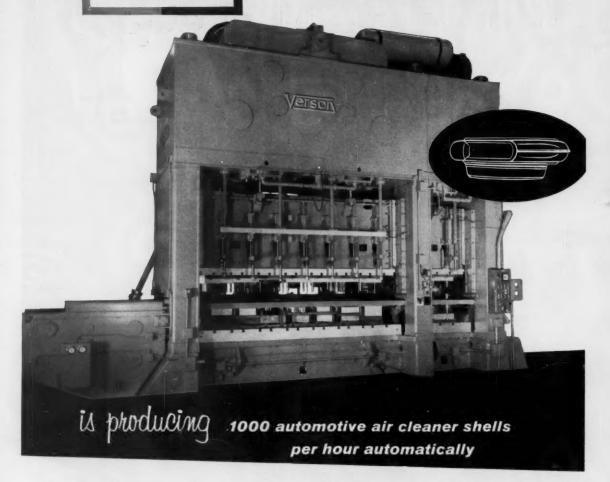
# Twin Screw Knee Support



BUILDERS OF
PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

this Verson ---

#### TRANSMAT PRESS



In another cost cutting production process engineered by Verson, this 900-ton two-slide Transmat press completes 1000 air cleaner shells every hour without human handling. The intricate part is formed from coil stock in eight consecutive oper-

Verson Transmat Presses offer unusual economy and efficiency whenever four thousand or more pieces, requiring four or more operations, are produced per day. Essentially a single press with multiple die stations and separately adjustable slides, the Transmat transfers the work piece by mechanical fingers synchronized with the press action. Feeding can be from coil stock or blanks. Intermediate handling, pickling or annealing is unnecessary.

The Verson Transmat is more than a press . . . it is a production process that can substantially reduce unit costs on a wide variety of mass produced stampings. Whatever your requirements, however - from several hundred to many thousand stampings per day - we will be happy to recommend the production process best suited to your needs. For specific recommendations, send an outline of your production problem.

A Verson Press for every job from 60 tons up.



ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS . SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES . TRANSMAT PRESSES . TOOLING . DIE CUSHIONS . VERSON-WHEELON HYDRAULIC PRESSES

22-MACHINERY, February, 1956

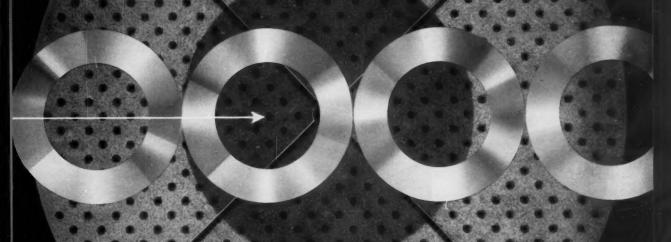
For more information fill in page number on Inquiry Card, on page 245

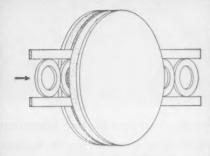
## Two grade disc cuts grinding cost 35% more production longer disc life

WORKPIECE Cast Iron Rings

FORMER PRODUCTION Smooth faced discs had to be replaced after grinding 21,500 rings.

PRODUCTION WITH GARDNER 2 GRADE DISCS raised to 29,000 rings.





GARDNER WIRE-LOKT® Abrasive Discs 30" x 2" x  $3\frac{1}{2}$ " with corrugated face

INNER GRADE—SOFT for maintaining flat face on discs

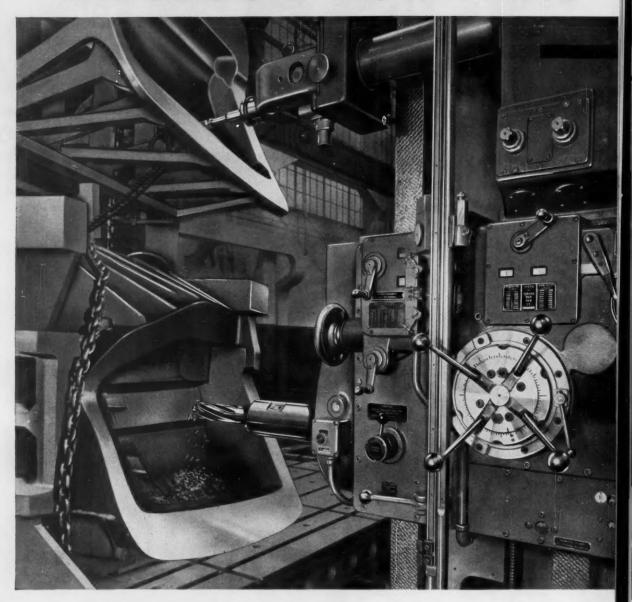
OUTER GRADE—HARD for shear cut and to resist "bell mouthing"

GARDNER

abrasive discs

BELOIT, WISCONSIN

## Available now...the



#### Dupli-Tracer System on G&L Horizontal Boring, Drilling and Milling Machines

With the *Dupli-Tracer* Giddings & Lewis Horizontals can do work on forms and intricate contours at extremely high feeds and speeds.

TRACING SYSTEM — The 3-D unit operates on

TRACING SYSTEM — The 3-D unit operates on a selective dual system, providing simultaneous control of the saddle and headstock or saddle and table for contour milling, or alternatively, table and headstock may be automatically controlled to give 360° profiling.

A single tracer head, mounted above the headstock, is extremely sensitive to deflections in all three axes used for tracing work. The three feed motions are driven by separate d-c motor-generator units. Generators are regulated by an electronic control which receives its signals from the tracing head. Feed rate in low gear can be varied from .4 to 5 inches and in high gear from 4 to 40 inches per minute.

## Duyli-TRACER®

Giddings & Lewis offers machine tool users the most advanced 3-dimensional electric stepless tracing and duplicating unit ever devised for contour tracing and 360° profiling operations

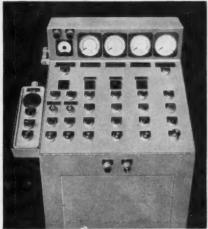
NOW you can obtain Giddings & Lewis Horizontal Boring, Drilling and Milling machines (table, floor and planer types) or Vertical Boring Mills with the most versatile 2- or 3-dimensional electric tracer unit ever offered.

The super-sensitive Dupli-Tracer enables you to perform a series of tracing operations in two or three axes in a smooth stepless motion - 360° profiling, die sinking, contour milling and turning, etc. Whatever the shape of the workpiece, the Dupli-Tracer does work rapidly and with extreme accuracy - faster and better than any other tracing unit.

Another important feature of the Dupli-Tracer

is the steering control, consisting of a potentiometer which can be rotated manually through 360°, enabling the operator to "steer" the cutter over the work. Thus the Dupli-Tracer is particularly adaptable for roughing from a layout or drawing. It is also helpful for spot positioning the tool for a cut ... bringing the stylus in contact with the template . and angle milling under manual control.

For more information on Horizontal and Vertical boring machines, equipped with the new Dupli-Tracer, see your nearest G&L representative, or write to Giddings & Lewis Machine Tool Co., Fond du Lac, Wisconsin.



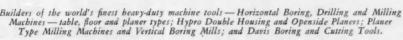
All indicating dials for speeds and feeds, movement of table, saddle and headstock, tracer steering and contouring plus controls for conventional operation of machine are conveniently grouped for quick and



When Giddings & Lewis Vertical Boring and Turning mills are equipped with the new Dupli-Tracer, they provide 2-dimensional tracing. The ram and saddle motions of the left-hand head are controlled by the 2-D unit. Each motion has a d-c motor, plus amplidyne-generator feed drive.

IGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN



#### A FASTER

more economical

## MACHINE OPERATION

■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

#### THE FOOTE-BURT COMPANY

Cleveland 8, Ohio
Detroit Office: General Motors Building









Continuous Type Broaching Machine. Made in 5 Sizes.

## FOOTBURT



#### How to have 2 strings to your bow

... SWITCH TO CIMCOOL', the radically new and different coolant that has become, in a few years, the largest selling chemical-lubricant cutting fluid in the world. Here are two big advantages of CIMCOOL Standard Concentrate over old-fashioned cutting fluids:



CIMCOOL DOES A BETTER JOB because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.



CIMCOOL LOWERS COSTS because it lasts longer in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.

For information on the many specific advantages of Cimcool Standard Concentrate—or details on the entire family of CIMCOOL Cutting Fluidsjust contact us. We'll have one of our Cincinnati Milling-trained machinists call on you-without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

\*Trade Mark Rea, U.S. Pat. Off.

#### •••••••••••••••••••••• CIMCOOL CUTTING FLUIDS

- CIMCOOL Concentrate—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical
- CIMCOOL Tapping Compound—Permits the use of highest tapping speeds and increases tap life amazingly.
- CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.
- Base Additive For jobs requiring an oil-base cutting fluid. Added to CIMCUT mineral oils, it gives an economical mix for higher speeds and feeds.
- CIMCOOL Bactericide The most effective agent yet developed to overcome rancidity and foul odors.
- CIMCOOL Machine Cleaner The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

0

JIMGUUL for 100% of all metal cutting jobs

Cutting Fluids PRODUCTION-PROVED PRODUCTS OF THE CINCINS

	DROD	UCTION	RECOR	PRODUCTION INCREASE	
		PART NAME	Turn, Face,	136.4%	
	PART	3/" Clamp Socket	Turn, Face, Counterbore, Chamier, Thread	226.3%	
		Socket	Face, Round, Turn	-	1 2 3
	SA.	1	Drill (2), Face (2), Tap (1), Chamfer (2)	45.99	- 12
		Tap Body	Drill, Turn Thread	43.5	
	A. 10	34" Air Co Body	Turn, Dri Thread Chamie		%
		Body	Drill, T	-	0%
	1	BottomF	Tange Face, Three Cha	ead, mier	
			-	5	9.7%
	1	Air Dis	stributor Ch	lamier	
			D	rill, Neck, ecess Tap,	49.4%
		1	-	Thread, hamfer, Seat	45.4%
		Mary W	ater Faucet Body	Drill, Face,	50.9%
				Drill, Recess,	86.2%
	3		lator	Thread	26.6%
N. J.		1	Air Regulator Body	Drill, Tap	20.0
17				Counterbore,	70.3%
71			Solid Tap Nu	lap	
The second		200	-	Drill, Fac	28.0%
			Tap Botto	om Counterbo	

## 74.9% AVERAGE PRODUCTION

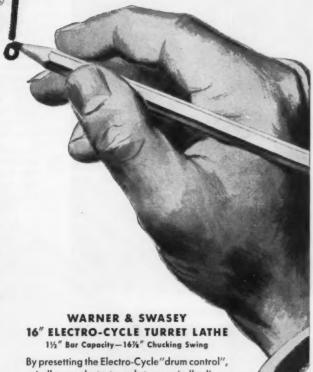
INCREASE WITH WARNER & SWASEY

ELECTRO-CYCLES

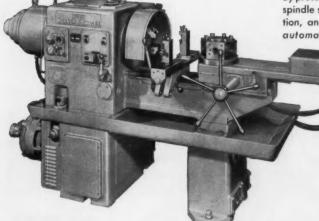
THESE PARTS are typical of the many different jobs machined in one brass shop on Warner & Swasey Electro-Cycle Turret Lathes.

Ranging from 2 to 6 operations, in lots from 100 to 10,000, each part is machined faster—more profitably—on the easier operating Electro-Cycles. The chart shows the exact results.

Electro-Cycles have made equally as impressive records in hundreds of other machine shops, turning non-ferrous metals and plastics. A new, improved 2-jaw air-operated indexing chuck now offers you even greater savings. Ask our Field Representative to show you how Electro-Cycles can speed production and build profits for you.



By presetting the Electro-Cycle"drum control", spindle speed, starts and stops, spindle direction, and reverses for each turret face are automatically controlled. Operator zips through precision operations, without tiring himself on time-consuming manual operations.



WARNER

&
SWASEY

Cleveland

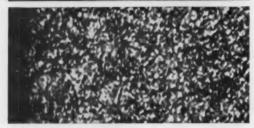
PRECISION
MACHINERY
SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

# New heat-treatment methods help High-Torque Unbrako socket set screws withstand up to 40% Higher Torques

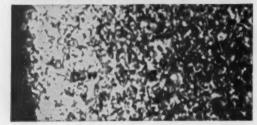
**UNBRAKO SET SCREW** 





ORDINARY SET SCREW





#### -you can set them and forget them

Research had proved that the tighter you seat a set screw the better it works. So we developed a set screw that could be tightened tighter than ever before without damaging the screw. One of the problems was developing new methods of heat treatment to eliminate decarburization. Decarb of course plays havoc with a screw. Put a wrench in the socket and you ream it. Run the screw into a tapped hole and you strip its threads. Try to seat it and its point shears off. These photographs are a study in contrasts. The UNBRAKO is clean, its grain uniform. There is no decarburization—the ordinary set screw is suffering from an overdose of it, socket walls, threads and point are full of the telltale white spots.

You can't buy a better screw than an Unbrako. And you can't get full high-torque performance without a "High-Titan" Unbrako Hex Key—the high-ductility, precision internal wrenching tool. See your industrial distributor. Or write Standard Pressed Steel Co., Jenkintown 19, Pa.

RECOMMENDED	SOCKET	SET	SCREW
TIGHTENI	NG TOR	QUES	
(Inch	-Pounds		

(Inch-Pounds)					
SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW	DIFFERENTIAL	
#4	5	3.9	3.5	28	
#5	9	7.8	7.4	15	
#6	9	7.8	7.4	15	
#8	20	14.7	14.5	36	
#10	33	26.5	25	25	
1/4	87	62	60	40	
5/16	165	122	125	32	
3/8	290	198	225	29	
7/16	430	309	350	23	
1/2	620	460	500	24	
5/8	1225	1106	1060	11	
3/4	2125	1540	1800	18	
7/8	5000	3660	4600	9	
1	7000	5025	6500	8	



UNBRAKO SOCKET SCREW DIVISION



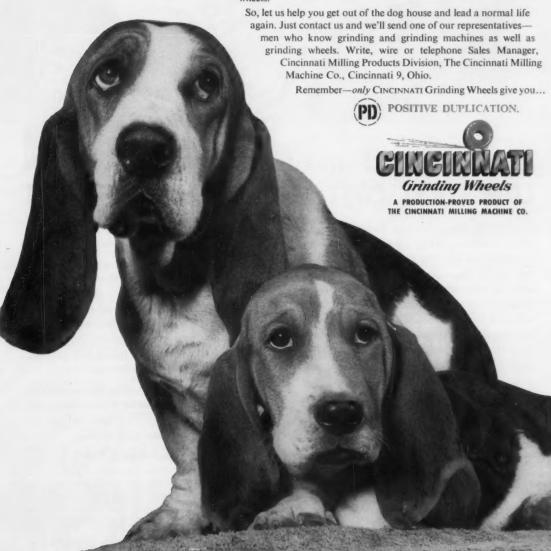
# Leading a Dogs Life.?

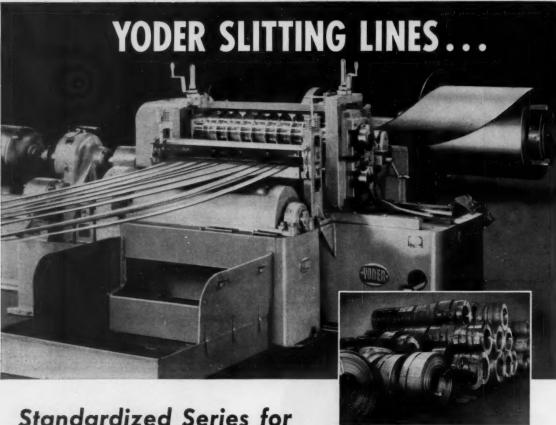
ARE YOU IN THE DOG HOUSE BECAUSE OF GRINDING WHEEL PROBLEMS? Then switch to CINCINNATI (PD) WHEELS. FOR now CINCINNATI Grinding Wheels offer

Positive Duplication—a remarkable achievement in precision manufacturing and quality control that can save you money . . . and increase your production.

Here's how CINCINNATI (PD) WHEELS can put a twinkle in your eyes and a smile on your face: through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel every time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels.





LOW FIRST COST AND OPERATING COST!

A relatively small, low-cost Yoder slitting line offers attractive savings possibilities and high production in slitting small and medium coil sizes and strip gauges. Yoder has standardized a series of such machines, affording a rare combination of low cost and productive capacity amply sufficient for the needs of the great majority of sheet metal fabricators and custom slitting shops. Supplementing the standardized series are special models for slitting big coils and beavy gauges at high speeds.

For requirements as low as 100 tons per month, one of the standardized Yoder slitting lines will pay for itself in short order. The savings PER

TON increase rapidly with decrease in coil size and width of strands to be slit.

Another important advantage gained by fabricators having their own slitter is the ability, from a relatively small stock of standard width coils, to meet expected and unexpected needs for slit strands in a few hours. This means easier production planning and greatly reduced strip inventories, in addition to lower prices and quicker deliveries of their strip purchases.

Yoder Slitter Book contains basic information on the economics and mechanics of slitter operation, with time and cost studies, production records and other valuable data. Send for it.

THE YODER COMPANY • 5504 Walworth Ave. • Cleveland 2, Ohio



ROTARY SLITTING LINES

COLD ROLL FORMING MACHINES ELECTRIC-WELD PIPE AND TUBE MILLS

## Production Pointers from



TIME-SAVING IDEAS



GISHOLT

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

#### MACHINING, THREAD ROLLING IN ONE OPERATION

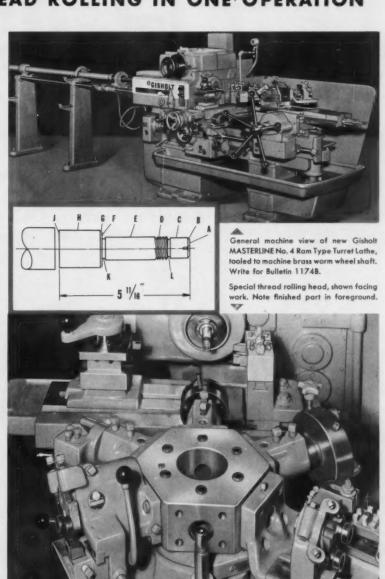
#### New Ram Type Turret Lathe Cuts Costs on Brass Bar Job

Time is saved and costs are cut on this typical brass bar job—by taking advantage of a smart setup combined with 16 spindle speeds from 60 to 3000 r.p.m., a 20 h.p. motor and a 3-second shift cycle. The machine is the new Gisholt MASTERLINE No. 4 Ram Type Turret Lathe.

A single lever at the front of the headstock controls the hydraulic collet chuck and bar feed. When the collet chuck is opened, a built-in stock stop and scale arrangement lets the bar feed carriage automatically advance stock the required distance. When the chuck closes, the bar feed automatically returns for the next stock advance—providing more accurate feeding and in this case eliminating the usual stock stop mounted on the hexagon turret.

Here's how the part-a brass worm wheel shaft-is machined and threaded in a single operation: from the hexagon turret, tools chamfer B, turn E and rough face F. Diameters C-D-H are finish turned and the work is centered. Then a 12 TPI class 4 fit thread is rolled on D with a special relf-opening thread rolling head, approximately 5 times faster than conventional chasing speeds. Still more time is saved with an electrical rapid traverse on the cross slide, where tools groove K-L, chamfer B-G from the rear and cut off at J from the front to complete the job. Floorto-floor time: just 2.37 minutes.

Worm wheel shaft production is boosted on this job through advanced features of the new MASTERLINE Ram Type Turret Lathe.





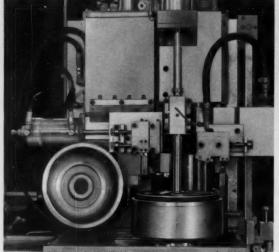
TIME-SAVING IDEAS

#### VERTICAL DESIGN MACHINE FACILITATES WORKPIECE HANDLING

#### New 12V Automatic Lathe Provides High Production — Requires Minimum Floor Space

Designed for easy loading and unloading of flat, heavy workpieces, the new Gisholt MASTERLINE No. 12V Automatic Production Lathe handles a wide range of machining operations quickly and efficiently.

Here, the workpiece is a steel torus cover produced by a well-known automatic transmission manufacturer. To eliminate distortion, the work is placed in a pot-type fixture. The underside of the flange rests against a vibration dampener at X. A springloaded tapered ring centralizes at Y. The work is held securely from above -with positive location against Zby an air-operated heavy-duty tailstock with a rotating head. Tools on the front carriage bore D and chamfer A. At the same time, tools on the rear independent slide are traversed to depth. Tools on an auxiliary slide mounted on the rear independent slide move transversely to face B-E and form C-F, completing the part. Floor-to-floor time on this job? Only 0.60 minutes.



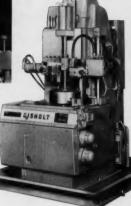
Workpiece and tooling. Note how piece is held in pot-type fixture.

New Gisholt No. 12V Automatic Lathe—compact, versatile, readily adapted to automatic handling.

Ask for new Bulletin 1175.

Gisholt No. 12V MASTERLINE Automatic Production Lathe—requiring minimum floor space—permits easy addition to existing production lines.



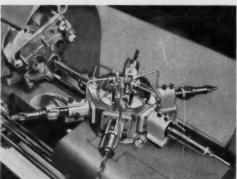


#### SPECIAL SETUP SOLVES ODD-SHAPE PROBLEM

#### Chucking Fixture on Fastermatic Simplifies Close Tolerance Machining on Gear Housings

Next time you're faced with machining an odd-shaped part, remember this Production Pointer. The workpiece is a cast iron steering gear housing. The machine—a new Gisholt 2F Fastermatic Automatic Turret Lathe—is tooled for drilling, boring and chamfering operations, and equipped with a special chucking fixture. Pins on the fixture provide rough location in the previously machined base holes, and correct angular location is taken from the previously machined workpiece base.

Four manually operated clamps hold the work. After rough drilling on the first hexagon turret station,



Note Fastermatic tooling—and also how the workpiece is held on a special fixture.

multi-diameter cutters machine 3 diameters at the rear of the workpiece and one at the front, and also form and chamfer. The operation is then completed with piloted Microbore tooling, which finish bores 2 diameters at the rear and one at the



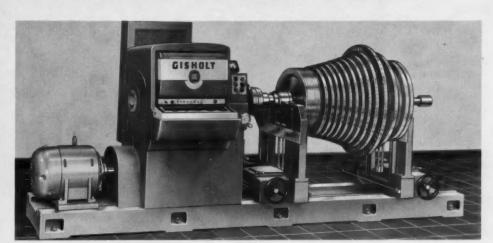
Workpiece, showing surfaces ma

front. Floor-to-floor time is just 3.25 minutes—with a 0.0005-inch tolerance held in the small rear bore.

Machining simplified with special feature on Fastermatic. Hexagon turret double-tooled to complete 2 parts with each complete index of turret.



#### IMPROVED BALANCER SIMPLIFIES OPERATION





Write for complete information—ask for Advance Data Bulletin No. T-1176-A and the new General Balancing Catalog.

TIME-SAVING IDEAS

#### Advanced Features on DYNETRIC Type "U" Reduce Setup Time, Cut Costs

Ordinarily, handling a balancing job like this would be quite an order. Instead, this massive steam turbine spindle is typical of work handled quickly—and easily—on the Improved Gisholt DYNETRIC Type "U" Balancing Machines. The machine above is the largest of 3 standard

stock models, designed to handle work weighing from 500 to 10,000 pounds with bearing diameters to 14".

Simplified controls provide faster setup, permitting the operator to locate the angle and measure the amount of unbalance in each of 2 preselected planes—with greater ease and efficiency than ever before. Other important new features include setup dials arranged in definite "Left Plane" and "Right Plane" groups; fewer controls to permit setup on a new part in

less than 15 minutes, and a re-run setup in less than 5 minutes; simplified operating controls more conveniently located; and an Amount of Unbalance Meter and Angle Indicating Protractor in the same visual field to reduce operator fatigue.

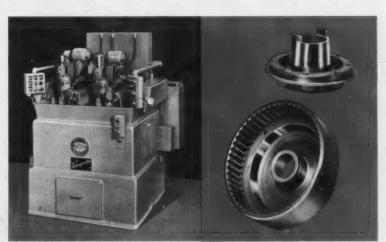
Reduced costs, increased production, easier operation and consistent accuracy make the complete line of Improved Gisholt Type "U" Balancing Machines worth your thorough investigation now.

#### TWO JOBS WITH ONE MACHINE, ONE OPERATOR = LOWER COSTS

#### New Superfinisher Handles Two Different Transmission Parts Simultaneously

Here is a smart Superfinishing setup for 2 different automotive transmission parts—a converter impeller hub and a drum and sun gear assembly housing. The machine is the new Gisholt No. 54 Two Spindle High Production Superfinisher. Both stations are handled by one operator—alternately loading, starting the automatic cycle and unloading the Superfinished parts.

The left-hand station Superfinishes the impeller hub O.D. from 30 micro inches RMS down to 3 micro inches RMS, and the right-hand station Superfinishes an I.D. in the gear housing from 125 micro inches RMS down to 12 micro inches RMS or less. For each station, floor-to-floor time is a short 45 seconds.



Separate push-button panels on Gisholt No. 54 Super-finisher simplify setup and control.

One machine—requiring minimum floor space and at a lower initial investment—

Impeller hub (above) and gear housing, both Superfinished in this setup.

Superfinishes 2 different workpieces economically at high production rates.





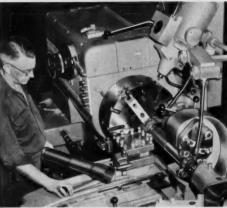
TIME-SAVING IDEAS

### LONG WORKPIECES EXPERTLY HANDLED WITH THIS SETUP

Square Turret
Tools on 3L Saddle
Pre-Set for Fast
Change-over

Cast iron packer bodies are completely machined in 2 operations on this Gisholt MASTERLINE 3L Saddle Type Turret Lathe. No time is lost, since tooling is expertly planned for maximum metal removal at each station. Change-over is also speeded up through pre-set tools, set in special mounting blocks on the square turret tool post. A cross-feeding hexagon turret permits use of same tools for different sized workpieces. Transverse location is simplified with a "tenth" indicator on the turret saddle. Threading from either the tool post or hexagon turret is provided by a full-length lead screw.

First operation consists of turning several outside diameters, forming, relieving and threading a portion of the small end O.D. from the square turret. With an open-side steadyrest



Close-up of the first and second operation workpieces, square turret tooling and steadyrest. Note power chucking arrangement.



Pre-set tool being inserted in turret tool post mounting block.

supporting, an 8"-long buttress thread is cut from the square turret, ending where the packer body O.D. enlarges. Hexagon turret tools then bore and ream the I.D., and chamfer and face the end. The work is then turned end-for-end for the second

operation. Square turret tools turn

the large O.D., face and chamfer. Hexagon turret tools then bore, taper bore, relieve and taper thread the large I.D. to complete the part.

Expert planning and pre-set tools—plus features like a cross-feeding hexagon turret minimize f.t.f. time on these long workpieces.

#### SWINGING LOADER BOOSTS PRODUCTION

#### Power-operated Fixture on Standard Simplimatic Saves .5 Minute Per Part

With this unique work-handling device on a standard Gisholt Simplimatic Automatic Lathe, cast iron cylinder head production has been increased 15%. Mounted on the headstock—and moving in an arc from machine center line out 90° to the front—is a power-operated swinging arm, which in turn mounts a 2-sided loading fixture manually indexed 360°. With the arm parallel to the machine center line, the loading fixture may be power traversed, longitudinally, in or out from the face of the chuck.

When the part is completed, the spindle stops and the loading fixture swings parallel with the spindle cen-



Operator removes finished part from loading fixture while next part is being machined.

ter line and traverses to the chuck. The operator then releases a pin (which holds the part as it is unchucked and traversed to clear the tooling)—manually indexes the fixture 180°—and the rough part is traversed to the chuck. Chucking is done with the pin released. The fix-

ture, with the finished part, traverses back to clear the tools and swings out towards the operator for unloading, to complete the cycle.

By absorbing a major portion of loadingunloading time into actual machining cycle, this loading device on the Simplimatic provides maximum production.

No. 1-256



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

#### VERSATILE

## MILL-M-MATIC for Accurate, Heavy Duty Production Milling . . . .

#### ... for POWER

THE MERRIMENTHER

#### 25 Hp. Anti-Friction Spindle Drive

Heavy duty milling head driven by large bull gear through involute spline. Extra wide bearing surface in housing when quill is fully extended.

# QUICK, QUIET OPERATION

... for

EFFICIENC

All machine functions

within easy reach. All-

electric, automatic con-

trols built to conform

with J. I. C. standards.



Hardened, ground gearing. Helical change gears for quick speed selections. Automatic spindle stop. 2-way automatic table cycles. All the features of Mill-M-Matic point up to high, accurate production.

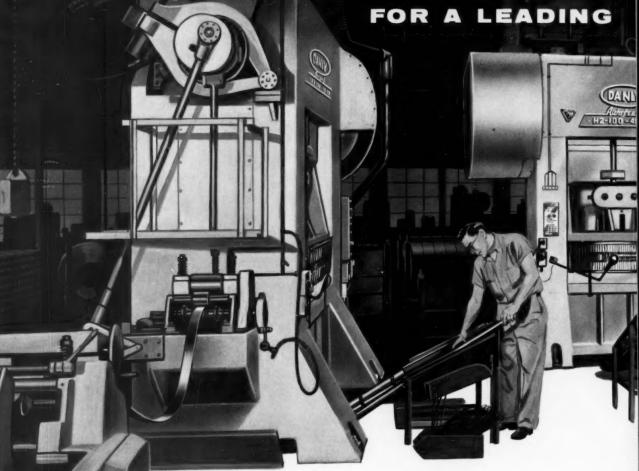
A fresh approach employing control by electricmechanical powered action opens new possibilities in long life and precision operation in the field of production milling. Our 10-page bulletin describes all the advantages found in Mill-M-Matic.

# The MOTCH & MERRYWEATHER Machinery Co.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO





#### Individual Press Production Jumps From 100,000 to 230,000 Laminations Per Day

Not only did this leading motor manufacturer double lamination production by switching to new Danly Autofeed Presses, but the additional benefits of much longer die life and greatly reduced maintenance provided exceptional cost savings as well. With the installation of new Danly presses, carbide dies were made practical in this operation for the first time. Danly's extra-rugged, extra-precise construction assures these dies a life expectancy of nearly three years — 200,000,000 pieces.

Maintenance records were set, too. Since installation, five Danly Presses have produced more than a quarter-billion lamina without downtime other than for die design changes and routine maintenance. Further, only 20% of the time formerly needed to keep dies in shape is now required. At the same time, each die is working harder, producing more than twice as many parts per day in the new Danly Autofeed Presses.

Find out why Danly Presses set such outstanding performance records . . . consult a Danly press engineer on your press requirements. Compare Danly

Presses against all other presses yourself...check the important Danly features listed at the right. Discover why Danly Presses mean increased production at lower cost. Write for the complete new catalog on Danly Autofeed Presses today.



It costs less to run a DANLY PRESS

lamination production

MOTOR MAKER

# Compare for yourself

#### BEFORE YOU INVEST ... BE SURE YOU GET ALL THESE FEATURES

 Machine tool precision in manufacture and assembly plus adequate lubrication assure smooth-

er operation, longer life.

Danly presses are delivered "run-in" tested.
 Assembly and operation in the Danly plant means fewer adjustments, faster installation.

- Danly's cool-running clutch lasts longer. Herringbone type gears and anti-friction bearings on high speed shafts wear longer.
- Extra-heavy construction reduces vibration and deflection. Dies last longer, presses stand up under severest duty.
- Danly features completely automatic oil lubrication including slide gibs. Should any vital bearing not be sufficiently lubricated, safety switch stops press and indicates the source of trouble.
- Performance records in the country's biggest stamping shops prove that Danly Presses require less maintenance, greatly reduce spare part needs.
- Controls designed and built by the press manufacturer assure the user of undivided, one-source responsibility for control and press performance on the production line.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

DANLY

It's easy to

#### **CUT WELDING COSTS**

when you use a High-Speed

#### **LINDE SWM-2**

Portable Sigma Welder

Your welding department can easily make high-speed, low-cost fusion welds in aluminum, stainless steel, high temperature alloys, copper, carbon steel, and other metals with the LINDE SWM-2 Portable Sigma Welder. The LINDE SWM-2 is a complete control unit for manual sigma (Shielded Inert Gas Metal Arc) welding operations. It mechanically feeds welding wire from a coil into the weld area at a steady precontrolled rate and supplies a regulated quantity of argon to shield the weld from contamination by the atmosphere. No flux is used. In most cases the smooth, clean sigma welds need no post-welding treatment.

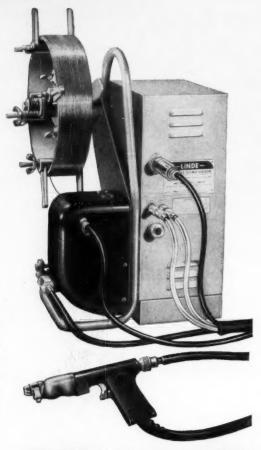
#### SIMPLIFIED AUTOMATIC OPERATION

The operator merely presses the trigger of the pistol type torch to energize the control circuit and start the flow of water coolant and argon gas. When an arc is struck by touching the consumable electrode to the workpiece, the wire feed automatically begins.

#### **NEW CONSTANT POTENTIAL POWER SUPPLIES CAN BE USED**

Either ordinary or constant potential DC power supplies can be used with a Linde SWM-2. In constant potential welding are voltages are preselected and held with outstanding consistency which permits positive starts and high-speed welds on thin metals.

Call your nearest Linde office today for more information on how you can cut production welding costs with the Linde SWM-2 Sigma (Shielded Inert Gas Metal Arc) Welder. Or write for your free Linde SWM-2 catalog.





Production jumped 300% when the Heller Engineering and Manufacturing Company, Lynwood, California changed to sigma welding to fabricate aluminum engine shipping stands. Because the sigma welds were clean and sound, post-welding treatment was practically eliminated.

#### Linde Air Products Company A Division of Union Carbide and Carbon Corporation

30 East 42nd Street III New York 17, N. Y.
Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.



**Customer reports** 

savings

in Machining Time with ...

BULLARD

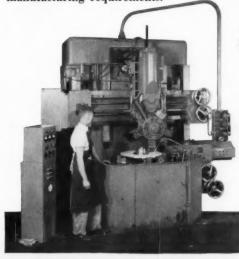
#### CUT MASTER V.T.L.

At the York, Pennsylvania plant of the York Corporation, manufacturers of refrigeration and air conditioning equipment, the new 36" Cut Master is running 24 hours a day machining hubs and covers for a turbo compressor impeller wheel.

They have calculated an 80% savings in machining time on the hub disc and 82.3% on the cover disc. As a result, the overall savings in all manufacturing operations for the turbo wheel amounts to 57.7%.

"The quality of the machined finish that we get with our new Cut Master, Model 75," says Mr. R. P. Feiser, Industrial Engineer, "is of such high standard that hand finishing is not necessary to meet our exacting manufacturing requirements."







These same savings can be applied to your
manufacturing cost problems — for full
information call your nearest Bullard
Representative or mail coupon for Catalog to

THE
BULLARD
COMPANY
286 CANFIELD AVE.
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PLEASE SEND ME A COPY OF THE NEW CUT MASTER, V. T.L., Model 75 CATALOG

NAME\_\_\_\_

\_POSITION\_

ADDRESS\_\_\_

CITY

ZONE\_\_\_\_STATE\_



# HELIARC Cutting

#### CUTS ALUMINUM AT SPEEDS UP TO 300 INCHES PER MINUTE

HELIARC cutting, a new process developed by LINDE, brings all the desired features of economical high-speed operations to the cutting of aluminum.

★ Speeds never before possible: Normal mechanized cutting speeds are 300 in. per min. in ¼-in. material, 125 in. per min. in ½-in. material, 75 in. per min. in ¾-in. material, and 50 in. per min. in 1-in. plate. If desired, lower speeds can be obtained by simply adjusting the controls.

★ Straight lines, bevels, contours—no problem: The new HELIARC cutting process can be used mechanically or manually. Both setups produce high-quality straight line

cuts, bevels, circles, and shapes with revolutionary new speed and efficiency.

HELIARC cutting employs a high-temperature, high-velocity, constricted arc between a tungsten electrode and the piece to be cut. The concentrated, columnated energy of the arc stream melts and ejects a thin section of metal to form a kerf. The gas atmosphere (a combination of argon and hydrogen) prevents oxidation of the cut face.

Learn the details of how HELIARC cutting can help you increase production and cut operating costs. Call your LINDE Representative today.

#### Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

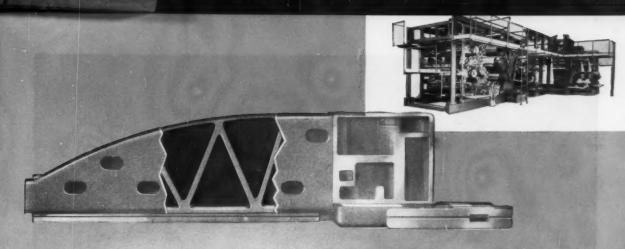
30 East 42nd Street III New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Carporation.





#### a long reach...

The Cottrell Company, world famed for multicolor printing press manufacture, relies on a 7' arm, 17" column "AMERICAN" Hole Wizard Radial for a variety of drilling, tapping and boring operations. In every instance the extra strength and rigidity

instance the extra strength and rigidity of the Hole Wizard arm has resulted in greater accuracy and longer tool life.

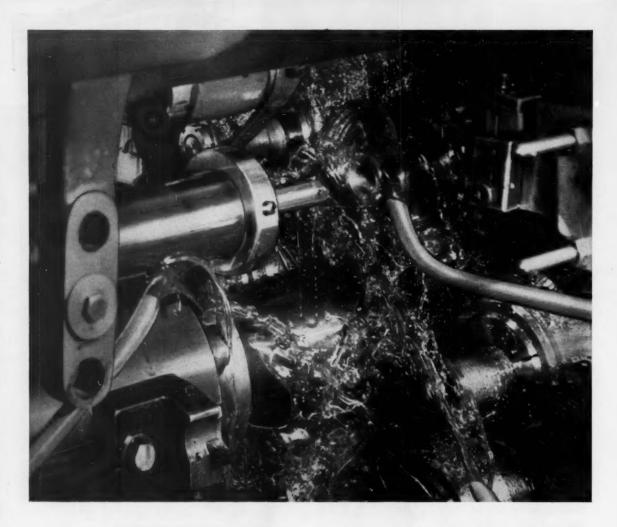
The accompanying closeup illustrates the box section arm with its full length triangular ribbing, providing an unmatched degree of stiffness and stress resistance.

This is but one of the many exclusive "American" features that make the Hole Wizard a marvel of productive efficiency.

Bulletin No. 327 tells you all the reasons.

It's a long reach
but the superstiffness of the
"AMERICAN"
Hole Wizard arm
guarantees minimum
deflection.





## No Staining!

Here's how to prevent staining susceptible metals. Switch to Sinclair WILKUT® Heavy Duty Non-Staining Cutting Oils. These sulphurized-fat type oils are particularly suited to general machining operations where metal staining is to be avoided. You get these extra benefits: easier heavy duty cutting on both ferrous and non-ferrous metals, excellent heat dissipation and wetting ability, minimum drag-off, and high stability for long sludge-free operation.

Another important advantage — you can apply Sinclair WILKUT Cutting Oils as a machine tool lubricant to avoid ill effects from cross-leakage of cutting fluid and lubricating oil.

If you have a staining problem, switch to Sinclair WILKUT Cutting Oils. Call your local Sinclair Representative for further information, or write for literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y. There's no obligation!

#### SINCLAIR

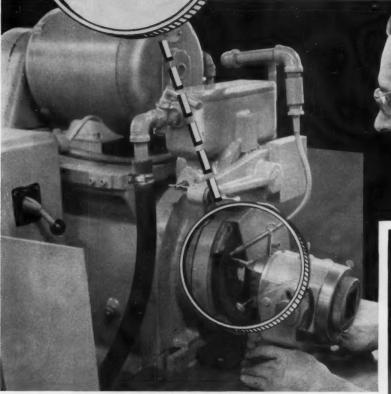
WILKUT CUTTING OILS

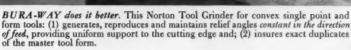
40-MACHINERY, February, 1956

## Unequalled

for carbide tool sharpening, the Norton No. 2 Bura-Way Grinder...









When your operator sharpens your carbide-tipped tools on the Norton No. 2 BURA-WAY Grinder he adds longer life value to these tools, helping you to make more profit and turn out better products for your customers.

Precise Duplicates Every Time

In the BURA-WAY No. 2 you have the ideal tool grinder. The BURA-WAY method increases tool life and gives you more pieces per sharpening. By exact duplication of the master tool, tremendous additional benefits may be realized from an effective tool control system and reduced set up time when changing tools.

#### Find Out More

Get in touch with your Norton representative whose knowledge and experience is further supplemented by Norton trained engineers. Only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.

Write Norton Company, Machine

Division, Worcester 6, Massachusetts. To Economize, Modernize With NEW



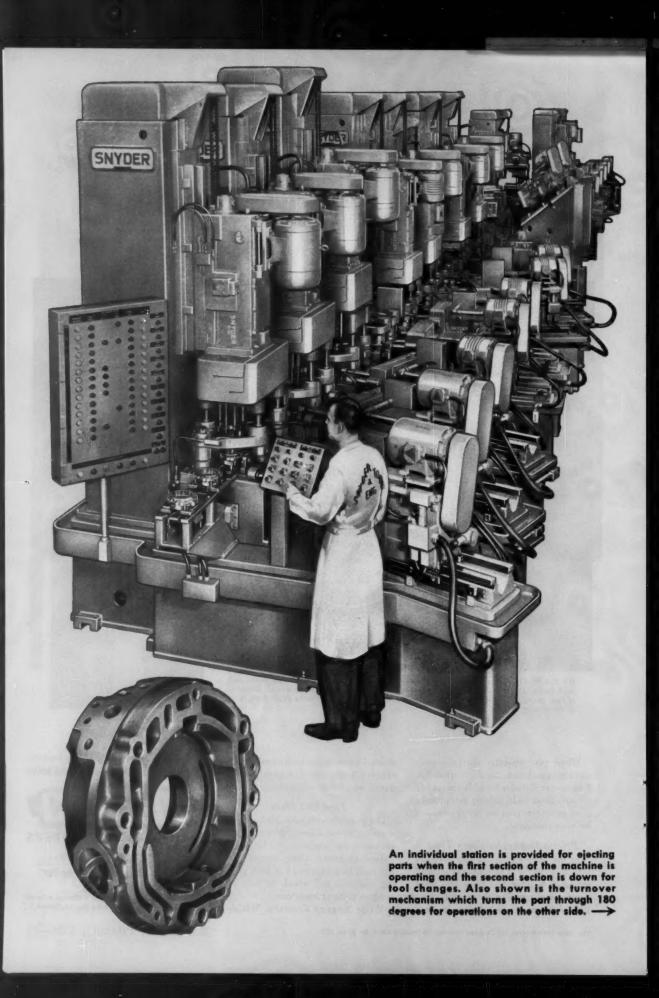
**GRINDERS** and LAPPERS

Making better products ... to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit In Canada: J. H. Ryder Machinery Co., Ltd., Taranto 5

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-41



AUTOMATION in 23 segment, 75 station, in-line, transfer machine permits part design flexibility, conversion to processing similar parts, limited obsolescence; drills, reams, spotfaces, chamfers, bores, counterbores, mills, taps, and automatically air gages work on automatic transmission front oil pump bodies at 144 pieces an hour at 80% efficiency.

## SNYDER

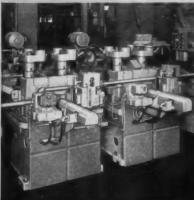
TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

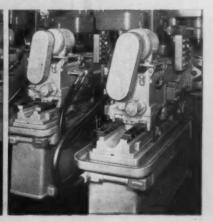
31 Years of Special Machine Tools with Automation

Segment bases are designed for mounting units for future operations, a feature of the flexibility and convertibility of the machine.

Each segment has individual push button station. Note the accessibility of tools.

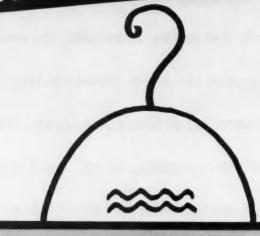






# COODLES







Bench Model BC-14D



You'd be puzzled, too, if your dad presented you with a bottle of powdered milk. Don't blame father, though . . . he's a Quality Control Engineer who's at his wit's end because of difficult inspection problems.

Happily for him...and the baby...we're in a position to help, by introducing him to the J&L Optical Comparator. This inspection deviceso fiendishly ingenious that it should have been invented by me - inspects and measures all

sorts of parts and objects, in a range of sizes. The J&L Comparator makes speedy production-line inspection a cinch, it's hellishly ac-

curate (to .0001"), and enables you to perform inspections that are not possible with any other method. Here is an instrument that's well worth your looking into (pun, 2nd class). For complete information, send this coupon today. We'll give your inquiry immediate attention (1st class):

**JONES & LAMSON OPTICAL COMPARATORS** 

Precise . . . Rapid . . . Flexible . . . Easy to operate



Floor Model FC-14



Inspecting location of ball contact points in steering worms, plus thread forms, solves a critical problem for the auto-



A J&L Comparator is used as a gauge to set and control limits of pre-set tooling for automatically controlled machining



J&L Comparator bends stamped parts to close limits — unattainable in regular process. Also inspects the parts in all planes in the same operation.



JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vermont, U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete J&L line of optical comparators.

name

title

street

company



# another cost saving performance record set by the GRAY PLANER CUB

Former planing time of steel bars and gibs was cut to ½ when this high speed GRAY PLANER CUB was put into action at a leading Midwestern metal fabricating plant.

This is accomplished by the Cub's high speed, greater power and tremendous rigidity—all essential to heavy duty carbide steel planing.

Proof of outstanding performance is the fact that this company has two more Cubs on order. Built in 24'' - 30'' - 36'' sizes. Write for Bulletin 55.

#### the job: planing hi-carbon, hi-chrome steel bars

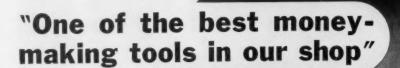
cut speed 160' per min. . . return speed 300' per min. . . . two heads . . . depth of cut 3/32" . . . (sed .048

The G.A. GRAY Company

planers \* milling planers
planer type milling machines
berizental bering machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. . SOLD IN LATIN AMERICA BY MACHINE AFFILIATES



Forming cylindrical sections 8° 0" long, 5° 0" diameter from %" steel plate.

With a Steelweld Press in your shop, you can handle almost any kind of a metal-forming job put up to you. Large heavy cylinders for buckets, drums, boilers, etc., are easily formed with standard bending dies.

You will find Steelweld Presses extremely versatile machines. With various jigs, dies and tools available, and others that can be developed for special purposes, a wide range of work can be performed on steel, aluminum, and the many alloy metals.

The opinions of many owners can be summed up in this statement of one: "A mistake that we didn't buy it years ago. One of the best moneymaking tools in our shop."

THE CLE

THE CLEVELAND CRANE & ENGINEERING CO.

5423 E. 281 St., Wickliffe, Ohio



## STEELWELD

BENDING PRESSES

BRAKING - FORMING - BLANKING - DRAWING - CORRUGATING - PUNCHING



For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-47



## THE MOST UP-TO-DATE AND COMPLETE CARBIDE TOOL CATALOG AVAILABLE

- A completely new carbide tool catalog, shadow indexed for ready reference.
- 92 pages contain complete listings on Super Standard Carbide Tools, sizes and engineering information.
- Many new carbide tools cataloged for the first time, including an extended line of solid carbides.

SUPER TOOL CO., DEPT. 362
21650 Hoover Road, Detroit 13, Mich.
Please send me my copy of Super catalog No. 5d.
Name
Company
Address
City
Zone
State

21660 Hoover Rd., Detroit 13, Michigan

5210 San Fernando Rd., Los Angeles 3, California

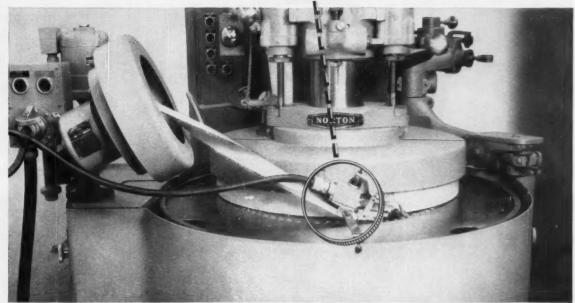
On small, flat parts
the Norton
Thru-Feed
Lapper

Lapper

brings 4 to 1 savings



Norton 26 Hyprolap Lapping Machine with automatic loading features that increase production of small, flat parts difficult to handle manually as much as 4 to 1 . . . as many as 8000 pcs/hr.



Automatic Loading Arrangement of Norton 26 Hyprolap lapping machine makes sure parts are in correct position before entering feeding trough . . . prevents ganging up . . . directs work in a path that assures even lap wear.

#### NEW, built-in automatic loading adds extra advantages to Norton 26 Hyprolap\*

Now you can make 4-to-1 savings in lapping small parts... and get top-quality results on every job. Investigate new Norton 26 Hyprolap lapping machines with the exclusive built-in thrufeed mechanism.

Here's why:

1. You speed up production. Loading and lapping operations handle parts as fast as 8,000 pieces per hour.

2. You cut handling. Loading and unloading are completely automatic.

3. You reduce downtime. Work path traverses the entire working surface of each lap... promoting even wear ... reducing the frequency of lap dressing.

4. You cut out operations. This lapper removes stock down to .0002" tolerances... makes surfaces parallel to .000025"... in many instances without pre-grinding of parts.

 You use less skilled help. Filling feed hoppers and removing finishedwork baskets are the only manual operations.

No wonder 4-to-1 savings are a matter of record with the new Norton Hyprolap with built-in automatic loading!

Send for Bulletin 852-7. Also submit

samples of your work for production estimates. Standard hopper-feed Hyprolap machines take work up to 1½" diameter. Modifications handle larger work. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize Modernize With NEW

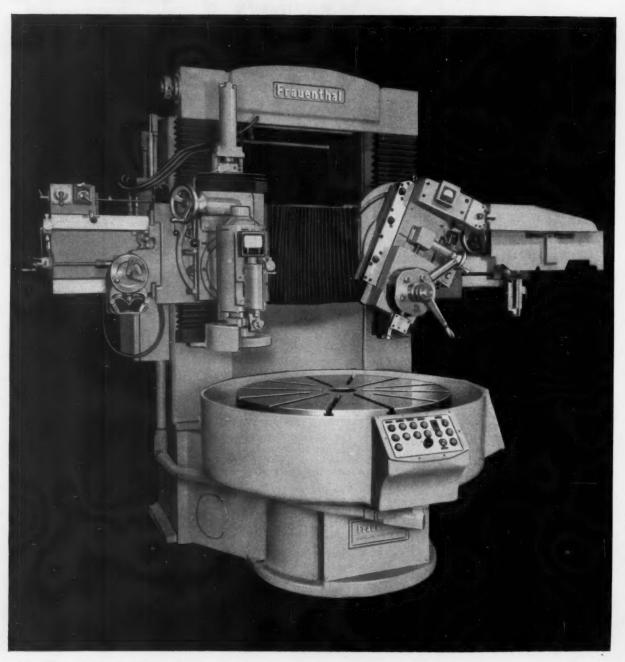


GRINDERS and LAPPERS

Making better products ... to make other products better

\*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

# CAN YOU to. 000200" accuracy



50-Machinery, February, 1956

# turn, bore and grind in a single set-up?

# The Frauenthal 3100 Series offers this precision and versatility with these cost-cutting features

- **1. Utmost versatility** Both grinding compound and turret slide can be swiveled to meet practically any angular requirement.
- **2. Super-precision performance** Only a Frauenthal grinds related surfaces to accuracies within .000200", producing consistently uniform precision in concentricity, parallelism and roundness.
- **3. Horizontal table** Loads easier and faster than vertical face plates. Horizontal table also provides greater stability for large, heavy parts.
- **4. Simplified tooling** Horizontal table permits simpler fixtures, particularly for thin-section jet engine parts, plus economy of dual purpose tooling for turning and grinding.
- **5. Convenient controls** All operating controls are easily within the operator's reach for quick selection of feeds and speeds. Electrical interlocks are provided for utmost safety.
- **6. Contour turning** Hydraulic duplicator attachment (turning head) performs tracer controlled turning operations most accurately and performs repetitive operations at lower cost.

May we help you?

If you'd like further information on how the 3100 Series precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.



Your choice of five positions of the grinding spindle











Frauenthal Division · KAYDON ENGINEERING CORP. · Muskegon, Michigan



At Wendel Research & Mfg. Corp.

# Shell Dromus Oil E increases tool life 60%, provides better cooling and increased production

Wendel Research & Mfg. Corp., Albertson, New York, encountered extremely short tool life when drilling A.I.S.I. 4140 steel used in the manufacture of pilot ejection seats. They also experienced broken bits, chip welding, discoloration and burning of the tools. Shell Dromus Oil E was recommended to combat these difficulties. Here are the results:

Dromus Oil E immediately ended Wendel's trouble. The drill and steel bar stock were very cool and easy to handle. Chip settling was excellent, and discoloration of tools and work was completely eliminated.

Here are some of the outstanding features of Dromus Oil E:

- Excellent wetting and cooling properties wets all metal surfaces extremely fast.
- 2. Provides longer tool life-better finish.
- 3. Not sticky or greasy—keeps tools and work exceptionally cool.
- 4. Forms a solution, not an emulsion . . . is stable in any concentration.
- 5. Easy to mix in hot or cold, hard or soft water.

Write for information on Shell Dromus Oil E. See how it can help you increase tool life.

#### SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK 100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA





The Red Ring Madel GCI is the ideal job shop gear shaving machine because of its marked versatility. With this muchine you can shave:





SPUR AND HELICAL GEARS TO 18" PD



INTERNALS TO 18" PD





GEARS



WIDE FACE GEARS



**GEARS WITH** LONG SHAFTS



CAMSHAFT

GEARS

LONG INVOLUTE **SPLINES** 



STRAIGHT AND CROWNED TEETH

SPUR AND HELICAL GEAR SPECIALISTS ORIGINATORS OF ROTARY SHAVING AND FILIPTOID TOOTH FORM



For high production work the GCI may be equipped with the Red Ring Automatic Differential Up and Down Feed, the Automatic Splash Guard Door and the Air Operated Tailstock to provide semi-automatic operation.

Bulletin 349-4 gives complete information and specifications. Write for it today.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . . . . . . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT





MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WIS., U. S. A.

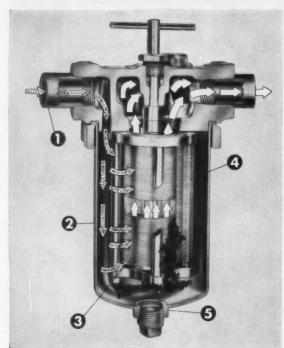
Skilled in Die Casting Mechanics
 Experienced in Lubrication Engineering
 Originators of Really High Speed Air Tools



#### BUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

# NOW! 40-micron, self-cleaning filter It's the new Cuno SUPER Auto-Klean



HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter (3). Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Cuno's new SUPER Auto-Klean is the first practical, compact micronic filter for lubricating oil, hydraulic fluid, coolant, fuel, and other industrial fluids.

Many times smaller than other micronic filters of equal capacity, Cuno's new SUPER Auto-Klean filter now makes possible economical, micronic filtration at high flow rates and eliminates the need for replacement cartridges in most cases. Here's what it offers:

1. Full-flow 40-micron filtration with a self-cleaning filter. Positive protection against particles larger than 40 microns (actually 0.0015 in.). All-metal filter can't rupture or channel.

2. Easy cleaning. Just turn the handle—by hand or continuously with motor drive. No interruptions for cleaning.

3. No cartridge changes. Ends operating costs if you've been using cartridge filters.

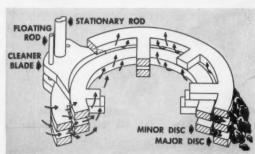
4. Low pressure drop, no pressure drop build-up. An 8" by 2\%" SUPER Auto-Klean filters 30 gpm of 200 SSU oil with only 3 psi pressure drop—up to 75\% more with slightly higher pressure.

5. High capacity in a small package. Many times smaller than replaceable-cartridge type filters of equal capacity, it saves with lower initial costs, lower installation costs.

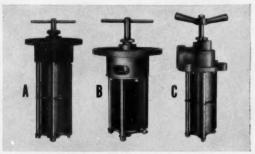
6. Easy to build into new equipment. Available for line-type housings (left) or incorporation in sump or reservoir (below.) Works in any position.

7. Easy to install in old equipment. Fits existing Auto-Klean housings. You can easily replace most 2½" diameter elements with SUPER Auto-Klean for finer filtration.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing equipment. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 15-2 South Vine Street, Meriden, Connecticut. 59



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against minor discs. Small arrows show flow. Short restrictions between minor and major discs stop 40-micron particles but allow high flow rate.



FILTERS FOR INTERNAL PIPING (A and B above) allow streamlined design plus the best infiltration. Flange mounting with external outlet (C above) and line-type (large cutaway above left) are just a few of many other possibilities.



AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

#### H-P-M 1000-ton FASTRAVERSE sheet metal drawing press equipped with a 300-ton die cushion and 400-ton blankholder.

# 50% REDUCTIONS CUT DRAWING COSTS

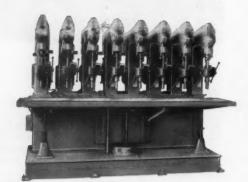


#### "We're Very Pleased With Our H-P-Ms"

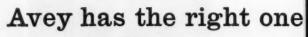
Mr. Homer F. Folk, Manager of Pressed Steel Department at A. C. F. Industries, Milton, Pa., reports, "We need an all-around versatile press and our H-P-M can be easily and quickly set-up and regulated for each specific draw job. The accurate control of drawing speed plus total elimination of high impactstresses guarantees proper metal flow and is one of the important factors in making reductions of 50% in one operation possible."

The H-P-M FASTRAVERSE press is infinitely adjustable for a multitude of drawing requirements. Independent control of each hydraulic action provides just the right tonnage for each job. Investigate these versatile all-hydraulic production units. Draw your sheet metal hydraulically. Write today for complete information.





(7) Super 8 spindle





(1) Bench type



(2) Column type



(3) Multi-spindle



Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures —would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

(Figures 1 through 6) Standard Drilling and Tapping Machines. Capacities in cast iron from very small numbered drills to 1½"; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

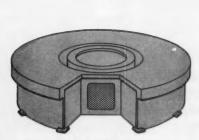
(4, 5, and 6) Avey tool room drills, built in No. 2 and No. 3 BMA-6 sizes. Large table 34" x 25"; round table 18" diameter; compound table 25" x 12".

(7) Super 8 Spindle Drilling and Tapping Machine. No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

#### for Avey makes them all



(9) Avey-draulic

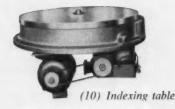


ne

(11) Standard base



(8) Cam feed unit





(8) Automatic Cam Feed Units. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½"; No. 2, 1". Mount at any angle. Fully or semi-automatic. Self-contained, tamper-proof.

(9) Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12" up to 30". Avey's patented Torque-matic control optional.

(10) Automatic index tables. Rapid, accurate indexing to .001". Even or uneven index patterns obtainable. 16" to 48" diameter. All adaptable to Avey standard bases.

(11) Steel Bases. One of Avey's standard line of fabricated bases. Stress relieved, sand-blasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI I, OHIO

drilling, tapping, production machines

# Yes you can sharpen carbides WITHOUT diamonds



#### BIG ATTENTION-GETTER at the MACHINE TOOL SHOW

These men in the huddle are watching Ex-Cell-O's new METHOD X MACHINE-many of whom actually sharpened tools on the machine—and all were impressed by the process that eliminates the diamond wheel in sharpening carbides.

- The "grinding wheel" is simply a. cast-iron disc.
- It does both roughing and finishing.
- It cuts carbides and steel at the same time.
- Cuts any material that's an electric conductor!

EX-CELL-O Method

TOOL

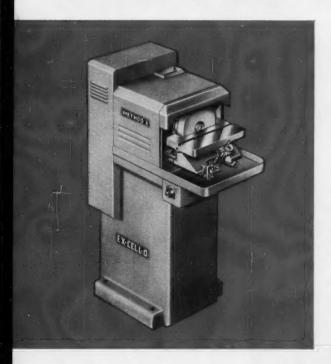
lengthens the life of your **CARBIDE TOOLS** because this process leaves

- NO heat checks—
- NO grinding cracks—
- NO saw-tooth cutting edges

EX-GELL-O Method

TOOL

#### You save the cost of your Method X Machine over and over, because you use no diamonds



Ex-Cell-O's Method X is an electromechanical process, sometimes called electro-spark erosion, for offhand sharpening of single-point tools. A current source has its positive terminal connected to the tool to be sharpened (which is at ground potential) and the negative terminal is connected through the mounting flange to an iron disc. A semi-solid dielectric or insulating film is applied to the disc to provide a spark gap. As the tool is oscillated across the disc, current pulsations jump across the spark gap, dislodging particles from the workpiece.

Method X produces a non-directional matte finish, the coarseness of the texture (and cutting speed) depending on the power selected. In the power unit, the electrical energy is stored for an instant, then quickly discharged. There are two cutting rates, selected by positioning a switch. The machine electric control is built to NMTBA and JIC standards.

Phone your local Ex-Cell-O representative — or phone, wire or write Ex-Cell-O in Detroit for all the facts about METHOD X.

EX-CELL-O METHOD X TOOL SHARPENER has an Ex-Cell-O Precision Spindle with inbuilt motor that rotates the 10-inch cast-iron disc. The tool-rest table is of ample size to support large tools firmly. The protractor plate indicates setting in degrees . . . No coolant is needed in the sharpening process.

#### EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

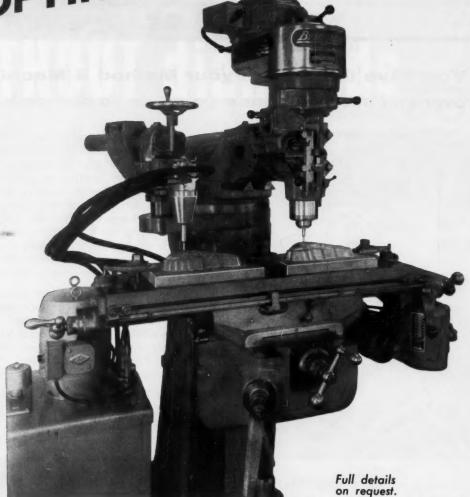
MANUFACTURERS OF PRECISION MACHINE TOOLS . GRINDING SPINDLES CUTTING TOOLS . RAILROAD PINS AND BUSHINGS . DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS . DAIRY EQUIPMENT



Method X off-hand tool sharpening is much like conventional grinding. Cutting speeds for carbides are comparable with those for grinding with diamond wheels. Your operators with experience in conventional grinding can change to the Method X process with brief instruction.

# Do you need





The Bridgeport True Trace combination will give excellent performance and save endless hours when copying irregular dies and moulds.

The stylus mounting fits between the column and the turret and is suitable for either right hand or left hand installation on new or old machines.

The stylus assembly swings out of the way so there is no interference when machine is used for conventional milling.

Bridgeport MACHINES, INC. Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



#### Here's a Hot Number

On "Acorn" Dies truly concentric adjustment demands lands with uniform "give".

Spring tempering by precision induction heating (controlled time and temperature) is one more manufacturing refinement that helps make *genuine* "Acorns" the HOTTEST BUY in spring type dies.

"ACORN" means GREENFIELD — GREENFIELD means QUALITY

GREENFIELD TAP and DIE CORPORATION

Greenfield, Massachusetts

# ETTCO-EMRICK Lead Screw Tapping Equipment

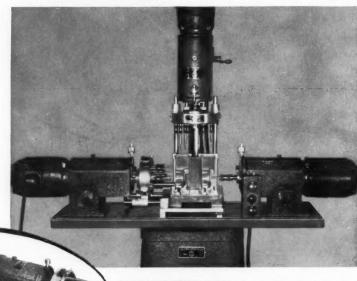
No reversing motor needed electro-magnetic clutches do the work

This exclusive feature provides a speed, sensitivity and precision unequalted by any other tapping method or device. It eliminates the need for a reversing motor, cams, air and hydraulic systems.

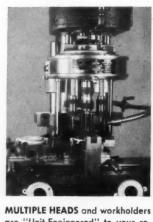
You get all these advantages in both single and multiple spindle operation because Ettco-Emrick all-electric Lead Screw Tapping Equipment can be used as single spindle units or in combination with Ettco-Emrick Multiple Spindle Heads. The equipment can be furnished: (1) as individual units; (2) as standard upright machines; or (3) as special machines buil? either by us or by you to your requirements.

GET THE FULL STORY in Bulletin A.T.U. Write today.

ALL-ELECTRIC operation and control... for the fastest, most accurate tapping yet!



BASIC LEAD SCREW UNITS when combined with standard Lead Screw Machines and Ettco-Emrick Multiple Heads and workholding fixtures give the advantages of high speed, precision "specials." Standardized Ettco components make this tooling practical and inexpensive.



MULTIPLE HEADS and workholders are "Unit-Engineered" to your requirements to insure fastest possible loading, positioning, tapping and ejection.

To Transaction of the Control of the

Clutch torque can be regulated to meet tapping conditions. Thread depth can be controlled to within ¼ turn of tap.

LEAD SCREW
MACHINE

LEAD SCREW UNIT

ETTCO TOOL CO., INC.
592 JOHNSON AVE. - BROOKLYN 37, N. Y.

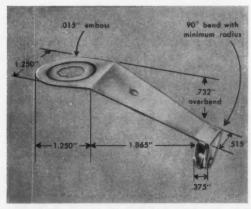
Chicago . Detroit . Los Angeles - Distributors throughout U. S. and Canada

TAPPING ATTACHMENTS . MULTIPLE HEADS . TAPPING MACHINES . INDEXING FIXTURES . TAP AND DRILL CHUCKS

#### This railroad runs better, will last longer



A Type ZW Lionel Trainmaster Control has four independent variable voltage circuits, can operate four trains simultaneously.



One of the four variable voltage taps in a Type ZW Lionel Trainmaster Control, now made of .0150" thick Duraflex in spring temper. This temper in Duraflex provides the extra strength needed—with the same forming properties as conventional phosphor bronze in extra hard temper.

#### DURAFLEX

The New Superfine-Grain Phosphor Bronze
with 30% Greater Endurance Limit

## Lionel switched to **DURAFLEX** for the hardest working parts of its Trainmaster controls

Much of the fun of model railroading depends on the smooth, dependable performance of its controls. That's why Lionel makes its Trainmaster controls tough, precision instruments—constantly guards their quality.

Lionel had been using an ordinary phosphor bronze in the vital, hard-working variable voltage taps. But they were troubled with fractures in forming the bends. To maintain their quality standards, they considered using another alloy, at substantially increased cost.

First, however, they tried Duraffex\*, Anaconda's new superfinegrain phosphor bronze. The fractures were eliminated. The press room found the forming qualities of Duraffex excellent. The Transformer Department was pleased with the reduction in rejects, found the strength and resilience better.

So Lionel has controls of superior quality – at no extra cost – for Duraflex costs no more than ordinary phosphor bronze.

Duraflex, because of its superfine-grain structure, offers greatly improved fatigue resistance and formability. It also has a finer, smoother, harder surface, plus good electrical conducting properties and high corrosion resistance. It is produced in sheet metal up to 0.062" thick and in wire up to 3/16" diameter. We will provide free samples for test purposes – specify gage and temper. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

an ANACONDA product



## Maytag switches to STANICOOL HD Soluble Oil...makes two-way saving

- 1 Cost of soluble oil reduced
- 2 Soluble oil consumption cut two-thirds

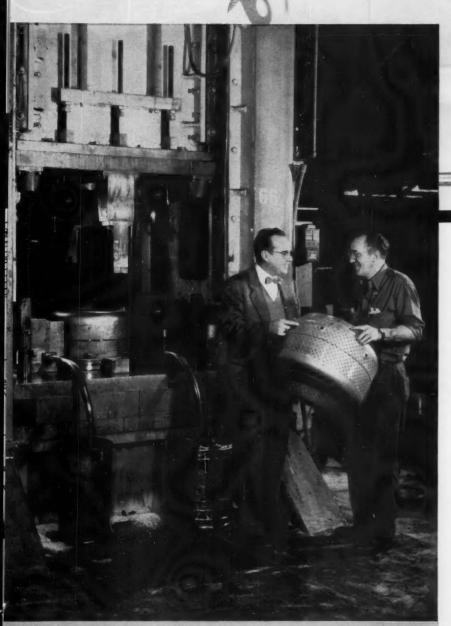
A 300 ton Verson press at the Maytag plant, Newton, Iowa, is used for piercing holes in the inner tubs of Maytag's fine automatic washers. Material used is 18 gauge enameling iron. Holes are pierced in six automatic cycles. A total of  $936-\frac{3}{16}$  inch holes and  $6-\frac{19}{32}$  inch holes are incised in each tub.

A check of manufacturing costs on the tubs disclosed that the cost of soluble oil per unit produced was too high. Standard Oil lubrication specialist J. I. Nelson, working with plant management, suggested a switch to Stanicool HD Soluble Oil. The switch was made and Maytag received the first part of its two-way saving: the cost of soluble oil per

gallon was reduced. Then it was found that the same high quality product could be turned out, without loss of tool life, while spraying only every third tub. Formerly each tub was sprayed with soluble oil before punching. With Stanicool HD, Soluble Oil consumption was reduced two-thirds. And thus, Maytag received part two of its two-way saving.

Perhaps STANICOOL HD Soluble Oil can help you make similar savings. Find out more about this quality soluble oil. Call your nearby Standard Oil office. There is one near you in any of the Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Maytag, leader in cutting laundry time for modern homemakers, knows how to cut manufacturing costs, uses STANICOOL HD.



Dwight Norton (right), a Maytag plant foreman, inspects automatic washer inner tub with Jesse I. Nelson, Standard Oil lubrication specialist. Jesse Nelson is well qualified to provide lubrication technical service. He has a B. S. degree in engineering from the University of lowa and has completed the Standard Oil Sales Engineering School. Jesse has been helping customers with lubrication problems for more than three years. Customers find his experience and training pay off for them.

#### Quick facts about STANICOOL HD Soluble Oil

- Emulsifies readily with all waters.
- Forms stable, uniform emulsion,
- Does not turn rancid.
- Non-injurious to men, machines and work.
- Economical. Meets work requirements with relatively low emulsion concentrations.
- · Prevents rusting of work and machines.
- · Gives better tool life.
- Doesn't form gum on machines.



STANDARD OIL COMPANY

(Indiana)

.this

# modern CINCINNATI PRESS BRAKE...



# gets the orders

at MARION MACHINE, FOUNDRY & SUPPLY CO. Marion, Indiana

This Cincinnati Press Brake immediately produced orders in a highly competitive jobbing market.

A \$25,000 job, which previously would have been lost, was profitably handled. A 3" channel with 2%" flanges was formed in six gauge material.

Investigate these modern design features for low cost production.

- · Centerline loading.
- · Rigid, All-Steel Construction
- · Deep beds and rams
- Interlocked construction
- · Large, high strength radii-free of weld
- · Ram elevation—complete with micrometer indicators
- · Tilting ram adjustment

Write for Cincinnati Press Brake Catalog B-4.

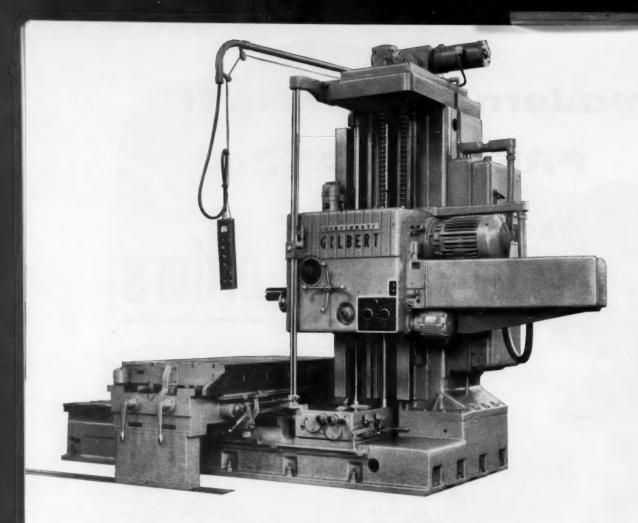
Photos courtesy the Marion Machine, Foundry & Supply Company, Marion, Indiana.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS . SHEARS . BRAKES





## new horizontal pampering mill

Preset dial for

power automatic changing of speeds and feeds • Pushbutton station,

always near operator, with:

Start, stop, reverse for spindle .

Control for spindle electric clutch and brake •

Reverse for all feeds .

Forward, reverse power rapid traverse •

Selection and control for spindle and

milling feeds and rapid traverse .

Separate control for

back gear clutch on spindle sleeve •

Selection of milling feeds to

head, table, and saddle .

Control of spindle feed electric clutch .

Power clamp to head; and

Automatic positioning if ordered •

softens operators, treasurers! A word of caution before you read about this all-new 4-5" horizontal boring mill: it will probably spoil your operators and your company treasurer as well.

Every feature, new from the floor up, is designed to make the operator's job simple, fast, and accurate. He'll look as if he's loafing, but his floor-to-floor time will be faster than it's ever been before.

It's your company treasurer who'll require careful tactics. At first, he'll think you're a shrewd man with a dollar when you show Gilbert's proposal. But then he'll think *all* budget items should offer this many new features per dollar—and few will.

Ask for Bulletin 855 (Table Type) and Bulletin 955 (Floor Type).

The Cincinnati Gilbert Machine Tool Co. 3366 Beekman St., Cincinnati 23, Ohio

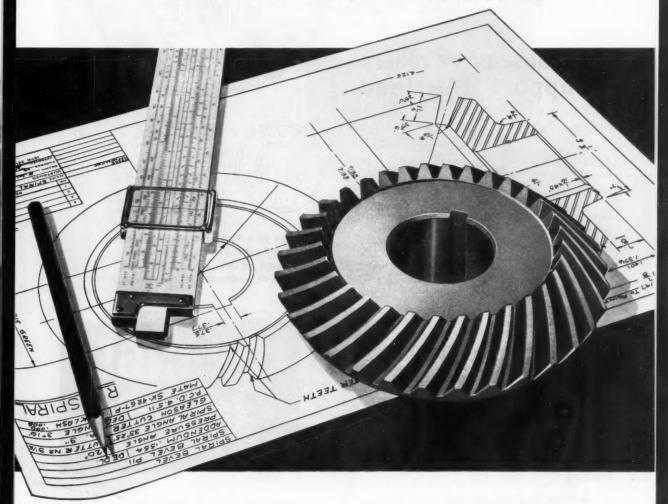
You can purchase one of these machines right now, by using our new low-cost financing plan: 6% simple interest (3% add on), up to 5 years to pay.

those who buy Gilbert buy GILBERT again

# "ENGINEERED QUOTATIONS"

When our engineers study our customers' prints, they look for ways to improve gear performance, ways to simplify gear installations, ways to cut gear costs. When they find a way that they consider better they report it to the customer for his consideration. Very often these "engineered

quotations" are accepted. Such careful scrutiny of every engineering and manufacturing step by *gear specialists* is one reason why so many manufacturers use Automotive Gear Works as their "gear department". May we submit an "engineered quotation" on your gear requirements?





FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS GEAR-MAKERS TO LEADING MANUFACTURERS

# Automotive Gear Works, inc.

ESTABLISHED IN 1914

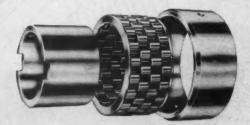
RICHMOND, INDIANA

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-71

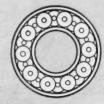
# More Load Capacity!

because more rollers support the load



In Orange "Staggered" Roller Bearings the load is distributed over many short rollers, instead of a few full length rollers.







End views of a Staggered bearing and conventional bearing show how the staggered rollers provide a multiplicity of contact points within the loaded zone.

#### **Outstanding for Heavy-Duty Service**

Wherever radial loads are extremely heavy—operating conditions are unusually severe—and even, precision running is absolutely essential . . . install Orange "Staggered" Roller Bearings.

The use of many short rollers in staggered arrangement, instead of fewer long rollers, provides the following advantages:

- Extra load capacity that does the work of larger conventional bearings.
- Smooth, precision running due to uniform distribution of load.
- Elimination of skewing tendencies of long rollers.
- Longer bearing life and extra margin of safety for your installations.

ORANGE
"STAGGERED"
ROLLER BEARINGS

Orange "Staggered" Roller Bearings are available in a full range of standard sizes, fully interchangeable with other bearings in the 200 and 300 series. Engineering service and stocks in all industrial centers. Write for Engineering Data Book,



ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

# Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cutoff from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

- A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.
- B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.
- C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.
- D. Use a non-breakable high speed hack saw blade—the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.

E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.

ff you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.

Formula for Accuracy in Metal

Efficiency of cutting-off operation is measured by:

- A. MACHINE SPEED.
- B. FEED PRESSURE.
- C. LABOR TIME.
- D. BLADE COST.



SAWING MACHINES

Sawing:

ACCURACY = (Straightness Squareness Squareness Squareness)

Straightness) = (Blade Rigidity Squareness)

MARVE | HICH-SPEED EDGE CHICAGO ZZ MADE IN U.S.A.

Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL-High-Speed-Edge Hock Saw Blades and Hole

The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts any machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively unbreakable. These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

MARVELSAVS

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue . Chicago 39, U.S.A.

... see it all at the ASTE Show next month in Chicago!



Large Precision All-Steel Die Set with clamping



Large Standard Die Set with Semi-Steel Punch Holder and All-Steel Die Holder. New clamping method shown.

# **ALL-NEW DANLY**

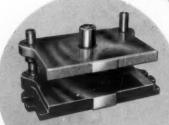
new dimensional standards... new longer life ... new features.



All-Steel Die Set



Semi-Steel Die Set



Long Precision Standard Combination Die Set



V-Punch Holder Precision All-Steel Die Set

#### 8 Reasons Why Danly Leads The Die-Set Field!



Precision chrome plated MICROME guide posts wear longer and are now standard on all Danly Precision Die Sets.



Easier faster clamping with Danly All-Steel Die Setsclamping holes used where left to right dimension is 20" or more.



. 2



Demountable bushings for exceptional degree of accuracy and ease of replacement are available.



Removal of punch holder made easier. This feature assures easy assembly and disassembly during die making, die setting or regrinding.



New oil lubrication system for guide posts and bushings further protects bushings and posts from wear.



Danly meets or exceeds ASA Standards . . . offers many sizes not listed by ASA for a more complete selection.



A complete new line of long and short shoulder Precision bushings of hardened steel . . . long shoulder types also available in hard bronze



All horizontal surfaces are ground to assure a flat, true working surface.

# LEADERSHIP LI

introduced in this all new Darly catalog

more than 200 pages of technical information



- The most complete description and listing of die sets and diemakers' supplies available.
- Many new items helpful to diemakers have been added.
- Every page designed and tested for easiest possible selection.
- Included price book simplifies
- Detailed drawings and photographic illustrations provide handy reference for designers and buyers.

Call the Danly Branch Nearest You . . .

BUFFALO 7 1807 Elmwood Avenue

CHICAGO 50

2100 S. Laramie Avenue

CLEVELAND 14 1550 East 33rd Street

DAYTON 7

3196 Delphos Avenue

DETROIT 16 1548 Temple Avenue

GRAND RAPIDS 2 113 Michigan Street, N. W.

INDIANAPOLIS 4

5 West 10th Street

DANLY MACHINE SPECIALTIES, INC.

Chicago 50, Illinois

LONG ISLAND CITY I

47-28 37th Street

LOS ANGELES 54

Ducommun Metals & Supply Co. 4806 South Alameda

MILWAUKEE 3

161 W. Wisconsin Avenue

PHILADELPHIA 40 511 W. Courtland Street

ROCHESTER 6

33 Rutter Street

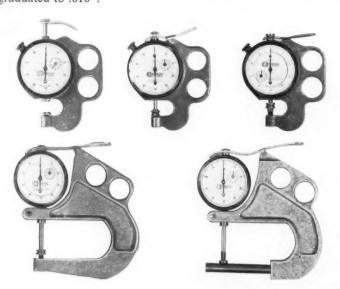
ST. LOUIS 8 3740 Washington Blvd.

SYRACUSE 4

2005 West Genesee Street

# NEW CALIPER and THICKNESS GAGES





# PORTABLE THICKNESS GAGES

Here is a series of convenient, easy-to-use gages designed to check the thickness of sheet metal, plastics, and even compressible materials such as leather. They are also useful for measuring diameters, lengths, and other dimensions of small parts. Deep-throated long range models are useful for clearing obstructions. Model shown at lower right is particularly well suited to measuring the wall thickness of tubing. Model shown at upper right is graduated to .0001"; other models graduated to .001".

FOR DETAILS WRITE TO

STANDARD GAGE COMPANY, INC.

72 PARKER AVENUE



POUGHKEEPSIE, N.Y.



# How A. O. SMITH CORPORATION plans a \$42 million equipment and facility expansion and modernization program

"The A. O. Smith Corporation, in setting up its \$42 million equipment and facility expansion and modernization program over the next four years, is drawing upon its collective experience among the various operating divisions to achieve the optimum utilization of capital invested.

"The use of experience and skills is accomplished through Project Committees, which formulate programs and are the focal point for review of results. They, in no way, supplant the normal operating organization, but are a supplement to bolster their operation through a pooling of experience.

"Approval of specific types of equipment is given by a Central Office Tooling and equipment Committee which reviews their necessity and the economics involved, and also recommends alternate equipment or methods. To date, the organization used has proved its value in developing workable programs and obtaining the best equipment to do the job. It has provided one answer to the problem of making communications work while, at the same time, keeping responsibility where it belongs.

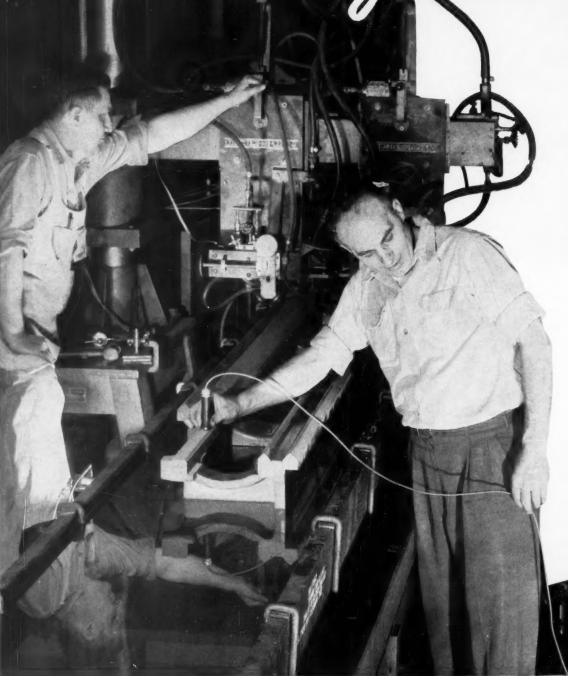
"The A. O. Smith Corporation manufactures automotive frames, gas transmission pipe, service station pumps, electric motors, weldrod, hydraulics, pressure vessels, heat exchangers, water heaters, home heating equipment, and Harvestores."

February, 1956

 F. S. CORNELL VICE PRESIDENT & GENERAL MANAGER A. O. SMITH CORP., MILWAUKEE, WIS.

ROCKFORD INSERT GROUP

# Something more





Machinery, February, 1956

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

# than quality control...

makes Hendey lathes life-long money-

#### makers in your toolroom or shop!

"We cannot produce a bad motor car. The guards would not permit it to leave the factory!" This statement was made by the executive head of Rolls-Royce, Ltd. Here at Barber-Colman Company, we sense the same devotion to perfection that marks the craftsmen who produce these fine automobiles.

At the left you see the exclusive induction hardening machine which is used to harden all Hendey bed ways. The inspector is checking the hardness of the ways with the most modern electronic comparator. The ways for both the carriage and tailstock are integral with the bed and are precision ground after hardening. Greatest possible accuracy and maximum wear resistance are qualities of the finished ways.

We are proud of the quality we build into our machines — proud of the exclusive features that have been designed into them.

For example, our No. 2E 14 in. General Purpose Lathe is equipped with an *electronically controlled* drive that provides infinitely variable spindle speeds between 15 and 1500 rpm. This feature increases operator efficiency, produces higher torque at low speeds, and permits changing speeds smoothly while the machine is under load.

These and other Hendey features mean profitable operation on toolroom or production turning jobs. Your Hendey dealer will be glad to discuss your machining problem with you. Call or write him today!

Hendey No. 2E 14 in. General Purpose Lathe



"Precision with Production"



machine division

BARBER-COLMAN COMPANY

32 LOOMIS ST., ROCKFORD, ILLINOIS



Machinery, February, 1956

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.





"Engineered Production" as applied to Transfer Type Machines

... combines standard

elements with progressive engineering









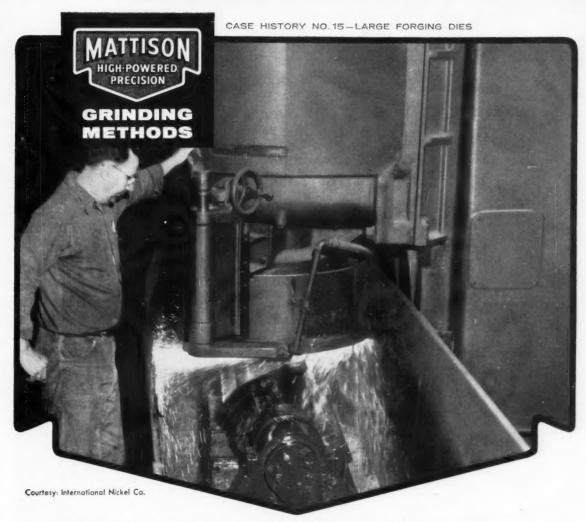




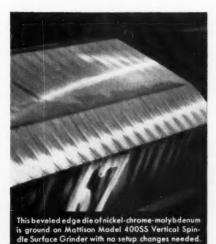








# \$3640 saved yearly by refinishing forging dies on Mattison 100 hp surface grinder



Savings of \$3640 in labor cost annually have convinced this Mattison user that it was wise to select a high-powered, precision surface grinder to do a job formerly handled by the planer.

The problem is to refinish forging dies for drop hammers used to work ingots into blooms, billets, or slabs. These forging dies are made of tough nickel-chrome-molybdenum steel and in the past they were reworked on the planer. Two dies could be machined at once, but two changes in setup were necessary to finish the beveled corners. Best production was four blocks per

shift and it was often necessary to remove tool marks by grinding.

Since the installation of a Mattison Model 400SS Vertical Spindle Surface Grinder, production has been increased to an average output of seven die blocks per shift. A holding fixture has been fitted to the grinder so the bevel edges can be ground easily by tilting the die. Operators report that the job is sometimes tough enough to tax the 100 hp spindle drive motor. For any job which requires a production team of power and precision, investigate Mattison Surface Grinders.

THERE IS A MATTISON
TO GRIND IT



Machinery, February, 1956



CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.



BORING UNITS

The example below is of a Sundstrand twenty-nine station transfer type machine for milling, drilling and boring operations on cylinder blocks. This, as well as other Sundstrand transfer type machines, is the result of combining standard and semi-standard elements with Sundstrand "Engineered Production" experience.



AUTOMATIC INDEXING UNITS



AUTOMATIC CHIP DUMPS

TRIPLEX RIGIDMILS

SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.

2530 Eleventh St. . Rockford, III., U.S.A.

Machinery, February, 1956

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.



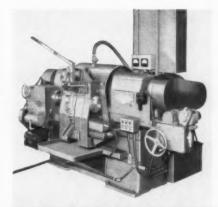


# Standard machine meets automatic requirements... grinds two sides of pins in excess of 1300 per hour!

Chrysler Corporation's New Castle, Ind. plant uses a Mattison No. 221 Double Disc Grinder to machine both ends of piston pins for six and eight cylinder engines for Chrysler-made cars and trucks at a production rate of more than 1300 per hour with a 20 micro inch finish. The machine produces at a rate that keeps it ahead of the production line. Automatic loading and sizing make it possible to run the machine with minimum attention by the operator. Tolerances are always well within specifications.

Operation of the grinder can be traced according to the numbers on the photo: 1) loading hopper for pins; 2) stacking drum; 3) channel carrying pins into grinder; 4) grinding station; 5) belt conveyor to next station; 6) loading hopper for next operation; 7) conveyor to centerless grinders for finishing o. d.

Stock removal remains constant because of the automatic equalization feature of the machine. These versatile double disc grinders may be the answer to your machining problem, too!



This double disc grinder produces more piston pins than the engine line can use with minimum supervision.





PRECISION SURFACE GRINDERS



#### hydraulic triple circuit

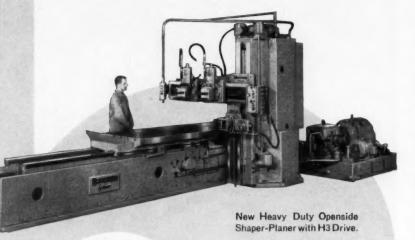
Infinite Speeds from 10 to 300 fpm., stepped through 3 distinct cutting force ranges.

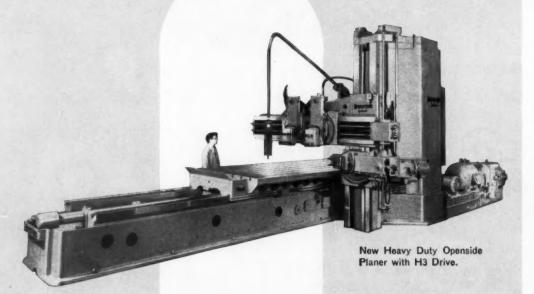
Pendant control of cutting speed selection.

Maximum return speed regardless of cutting speed.

Quick reversals with minimum overtravel.

Suitable for prolonged use on short stroke work, as well as long work.







provides 3 distinct drives in a single machine!

# drive

machines free-cutting metals at high cutting speeds machines average metals at average cutting speeds machines tough metals with slow, heavy cuts

Hydraulic drive and feed inherently provide efficiency and ease in planing and shaping metal. Now a new dimension has been added to this proved efficiency and economy of hydraulic power. This exclusive new feature on Rockford Hydraulic Planers is called h3 drive—a triple hydraulic circuit to provide the correct combination of cutting speed and required force to most economically machine materials from the free cutting types to the toughest steels.

Many plants, large and small, who are evaluating their present production equipment will find the h3 drive a significant development in their plans for plant modernization.

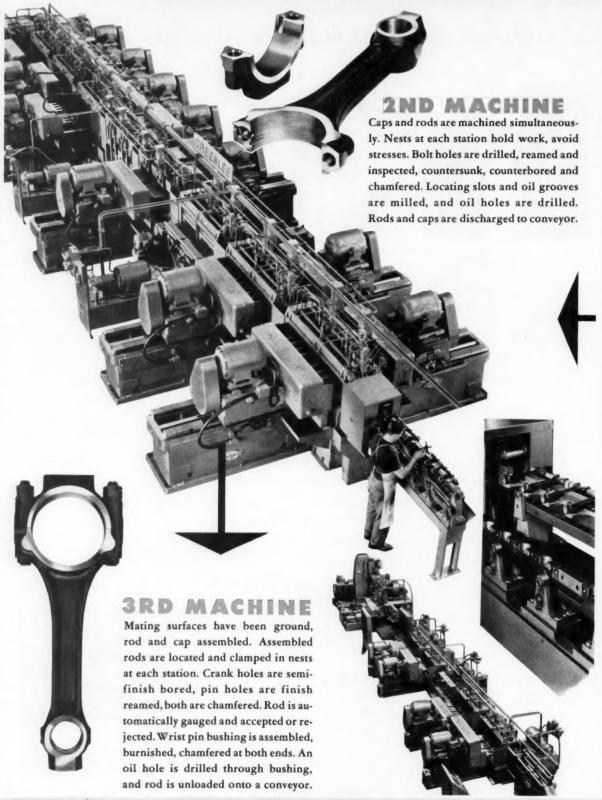
We invite you to get full details on this new hydraulic achievement from any Rockford Machine Tool Co. representative, or write directly to us.

ROCKFORD MACHINE TOOL CO. 2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS





# another first ... GREENLEE

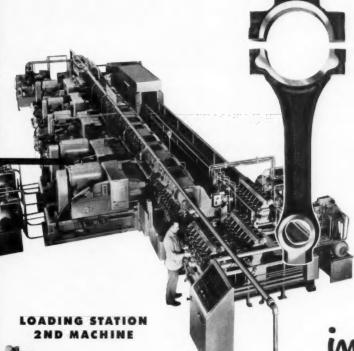




## CONNECTING-ROD TRANSFER MACHINES!

# Greenlee Built Automation into Connecting Rod Production

result: GREATER ACCURACY, LOWER COST



#### IST MACHINE

Single-piece rough forgings, with bosses finished, are pallet loaded. Clamping in nests avoids stresses. Crank holes are elliptical bored, pin holes drilled and reamed, caps cut off, caps and rods automatically unloaded onto a conveyor.

Send for Bulletin No. 457

investigate

GREENLEE CREATIVE THINKING . . . AUTOMATION EXPERIENCE... ENGINEERING

See how Greenlee can help you avoid production bottlenecks in proposed new facilities... overcome existing production problems... reduce production costs... and help you attain a better, stronger, more competitive position in your industry.



GREENLEE BROS. & CO.

1862 MASON AVENUE ROCKFORD, ILLINOIS



# PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE











### Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine... yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately... complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident... it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs... improve product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS

Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.



BUILDERS OF BETTER MACHINES SINCE 1879

MULTIPLE SPINDLE DRILLING . BORING . TAPPING



cut Finishing costs

## THROUGH HIGH PRODUCTION-PRECISION CONTROL

using

### BARNESDRIL

#### PLUGMATIC SIZING

works automatically to give bore-to-bore size control over every piece honed, making each interchangeable with the others. Sizing is not affected by misalignment or eccentric stone wear.

#### ELECTRONIC CONTROL OF HONE EXPANSION

keeps honing operations always at peak efficiency because it automatically compensates for stone wear. With electronic hone expansion control, you can select any degree of finish you require, through proper rate of feed, grit, grade and bond of abrasive stone.

#### EXTRA-DEEP HONING STONES,

with support provided right up to the cutting edge, give much more usable abrasive. Improved body design and stone-mounting with increased cutting edge support, result in longer life and freer cutting action.



### No. 307 VERTICAL HONING MACHINE Job Specifications:

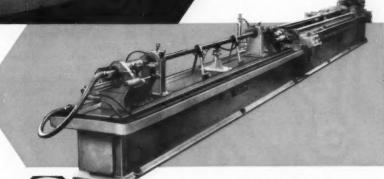
Steel Hydraulic Cylinders
Bore — 3.000" I.D. x 10½" length
.012"/.017" stock removed
Bore Sizing — within .0005"
Finish — 25 R.M.S.
34 pieces per hour

#### No. 3B HORIZONTAL HONING MACHINE Job Specifications:

Steel Tubes
Bore — 1.500" I.D. x 10 ft. length
.012"/.016" stock removed
Bore Sizing — within .0005"

#### DETROIT OFFICE

3419 South Telegraph Road Dearborn, Mich.



send for complete catalog bulletin 5005

#### BARNES DRILL CO.

820 CHESTNUT STREET . ROCKFORD, ILLINOIS



Machinery, February, 1956

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

LOWER TRANSMISSION CASE





Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Finial Drive Housing.

NTERMEDIATE

5 Operations

10 Operations





8 Operations

10 Operations





**UPPER TRANSMISSION CASE COVER** 







INVESTIGATE BARNES' 6-POINT MACHINE TOOL BUILDING SERVICE . . .

A Coordinated Creative Engineering and Manufacturing Service designed to help you solve problems quickly and efficiently. Write today for your free copy of "Coordinated Machine Engineering".



FINAL DRIVE HOUSING

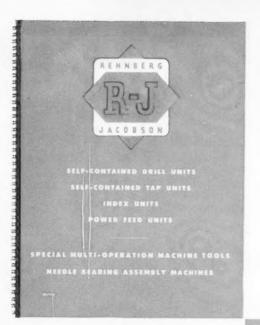
2 Operations
AUXILIARY HEADS COMPLETE 2 OPERATIONS AT
RIGHT ANGLE TO REGULAR MACHINE SPINDLES





W. F. & JOHN BARNES COMPANY . 402 SOUTH WATER ST., ROCKFORD, ILLINOIS MACHINES . AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES







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## SEND FOR THIS THE MANUAL

It contains detailed specification sheets and complete dimension drawings on all the standardized R-J Drill Units, Tap Units, and Index Units. Also, you will find wiring diagrams for the individual units and for any combination of them. With this information you can determine just what operations you can perform with the R-J units, and exactly how they will fit on any machine structure you have in mind. Finally, the Manual contains numerous illustrations and descriptions of various types of Special Machine Tools designed and manufactured by Rehnberg-Jacobson, and some examples of an R-J specialty—Needle Bearing Assembly Machines. Write for a copy of this R-J Specification Manual today. If you need extra copies, we will be glad to furnish them as long as the supply lasts.

Designers and Builders of Special Machinery

REHNBERG-JACOBSON MANUFACTURING COMPANY



2135 KISHWAUKEE ST.

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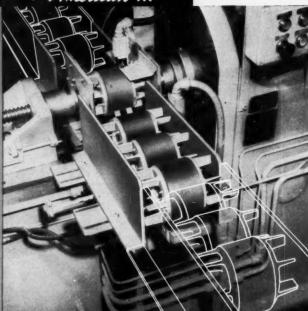
ROCKFORD, ILLINOIS



more about AUTOMATION by American ..

Broaching I.D. of rotors boosted to 200 PER HOUR



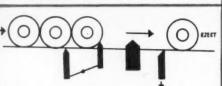


PARTS FED AND EJECTED AUTOMATICALLY ON INCLINED CHUTE

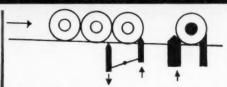




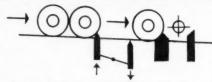
As cycle starts, split vee drops and part rolls into broaching position.



3 Broaching stroke completed. Split vee drops and part is ejected.



2 Broaching stroke begins. Retaining jack drops and second part rolls into hold position.



Broach carriage returns. Retaining jack drops and second part rolls against split vee.

MACHINE BROACHES DIFFERENT ROTOR SIZES



Thrust bushings on the clamping mechanisms seat in the I.D. of the rotors' fan sections. Simply by changing these bushings and adjusting the chute guides horizontally and/or vertically, rotors of varying diameters and thicknesses are broached on the same machine.

Whatever degree of automation is included in your production planning, if it involves broaching or machine assembly, American engineering can help you greatly. 'Phone or write us details.

Ask for Catalog No. 450



MERICANO BROACH & MACHINE CO

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery







The winner and still champion after fifty years is Crucible's REX high speed steel. And now it's better than ever! Recent improvements in manufacturing processes have given even higher quality and greater uniformity to every one of its properties.

Why not shop test the new REX yourself? Test it for size, structure, response to heat treatment, fine tool performance. Give it any test you wish. You'll see why it is today, as it has always been - the standard by which all other high speed steels are compared.

Ask for REX by name at your local Crucible warehouse. Or order it directly for prompt mill delivery. And for information on REX, and the other Crucible special purpose steels, send for the Crucible Publication Catalog. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

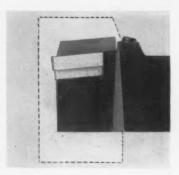
CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-93



**New design** eliminates "club" below shank; reduces overhang to absolute minimum. Indexing is fast, simple . . . accuracy is increased.



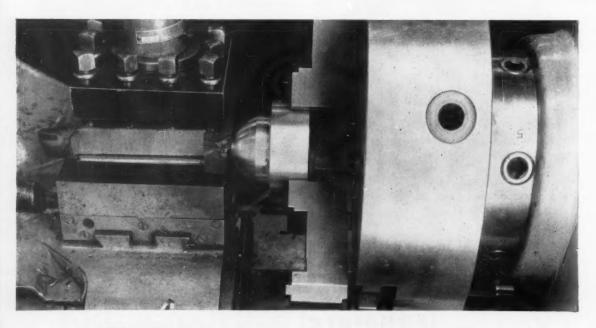
Clamp has built-in, wear-resistant carbide chipbreaker. Requires only light finger pressure to tighten; assures uniform chips on any cut.



Indexable carbide pad is screwed to shank. Stays put while blank is indexed. Absorbs shock; decreases the possibility of holder damage.

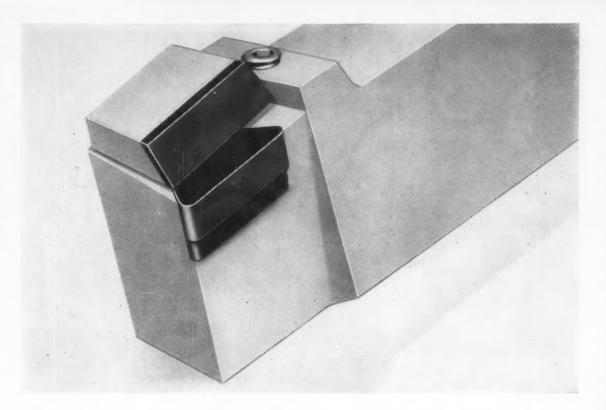
Because they combine four basic design improvements . . .

## NEW CARBOLOY TOOLHOLDERS ARE EASIER



Contouring Stellite valve. Round Carboloy cemented carbide insert is furnished precision-ground, eliminating costly grinding operation required for braze-type tools. Inserts on new

Carboloy toolholder are indexed or turned over right in the machine . . . reducing downtime. With Carboloy holders, only inserts are stocked . . . saving valuable toolroom space.



# TO USE...STRONG, SIMPLE, AND ACCURATE

- ► Single screw indexes insert; automatically sets chipbreaker
- ► Carbide pad absorbs shocks; cuts throw-away insert costs
- New design reduces overhang; improves tool accuracy
- ► Heat-treated shanks resist bending and deformation

Simply adjust a single screw at the top of the shank, and the cutting blank can be indexed or turned over while the Carboloy holder stays in the machine. The carbide chipbreaker is set automatically in the correct position.

#### Carbide pad cuts insert costs

Because the carbide pad absorbs shocks and gives greater rigidity, thinner, harder, more economical cutting blanks can be used. Machines operate at greater speeds and feeds; increase output at reduced cost.

Carboloy design eliminates projections below the shank . . . reduces overhang, increases accuracy and rigidity. Minimum projection above the shank stops chip interference, protects clamp from abrasive chips. Heat-treated shanks give the holders extra strength to resist clamp-screw deformation and chip wear.

#### Handle special jobs with ease

The Carboloy holder design is quickly adaptable to "specials" with cutting angles other than standard, and to positive or neutral rakes. New, compact design makes them especially efficient for gang tooling.

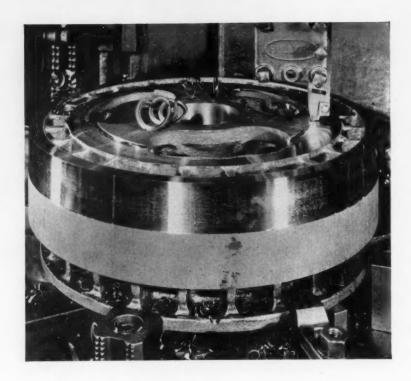
Available for round, square, or triangular blanks, the Carboloy holders are stocked in seven styles and 52 sizes. New, heavy-duty holders are also available. For prices and specifications, send in the coupon on page 4 of this advertisement.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY



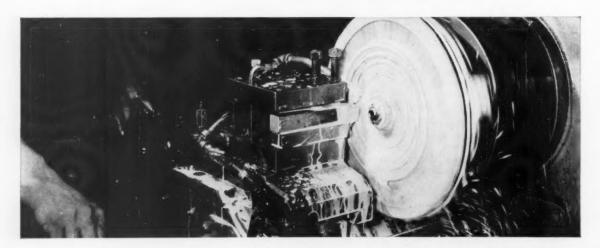
FACING POWER - SHOVEL CLUTCH AND BRAKE DRUM. It took as many as 16 of the former carbide tools, on a 42-inch Bullard, to make a single cut through multiple sand inclusions and heavy interruptions. A Grade 370 tool took nine cuts without any appreciable wear. Because the Grade 370 tool outlasted 144 of the previous tools, over-all machining costs were cut almost 70%, downtime costs were reduced from \$60 to \$1, and grinding was completely eliminated.

SETUP: Material—1045 low carbon, high manganese cast steel, with hardness of 27 R<sub>c</sub>. Speed—24 RPM. Feed—0.018-0.033 inch. Depth of cut—3/8 inch. Coolant—No.



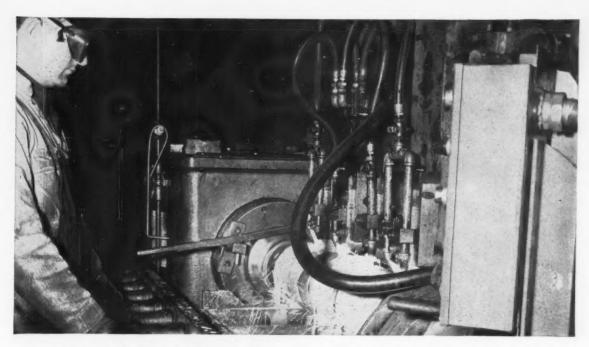
Hundreds of in-plant case histories prove ...

## CARBOLOY GRADES 350 AND 370 CUT FASTER,



FACING TURBINE WHEEL BUCKET. It took 60 carbide tools, making two separate cuts, to get daily production of 25 units at Kelsey-Hayes Wheel Co. By switching to Grade 370, the two-cut operation was compressed into one, the number of tools required was reduced two thirds, and production was almost doubled.

SETUP: Material — Inconel, heat-treated to  $18\,R_c$ , welded to rim of Stellite. Speed —  $125\,$  sfpm. Feed —  $0.0155\,$  inch. Depth of cut —  $36\,$  inch. Coolant — Yes.



TURNING 8-INCH STEEL SHELL. Grade 350 increased production runs on these forged and extruded shells between 15 and 20 pieces per grind. At toughest stage of roughturning operation, Grade 350 processed 4 times as many shells as other carbides.

SETUP: Material - 1045 steel with varying heat analysis. Speed -302 sfpm. Feed -0.044 inch. Depth of cut -3/16to 7/16 inch. Coolant - No.

## WEAR LONGER, GREATLY INCREASE OUTPUT

- ▶ Outperform all other steel-cutting carbides
- ▶ Take heavier, deeper cuts without deformation

The machining records in plant after plant show Carboloy Grades 350 and 370 are capable of increasing output up to 300% over previous carbides used.

Not only do these grades outperform conventional carbides at higher speeds and feeds, but they outwear them on the toughest jobs - in some instances by margins as high as 144 to 1. (See case history above at left.)

#### Built-in structural rigidity

Carboloy Grades 350 and 370 are extra-performance carbides. Their superiority is due to the greater structural rigidity built-in by the Carboloy manufacturing process.

This process enables them to take deep, pun-

ishing cuts without the chipping, cracking, or cratering encountered in other carbides . . . even at temperatures as high as 1800° F.

#### No "equivalent grades"

Try heavy-duty Grade 370 and medium-duty Grade 350 in your own plant . . . compare them with regular tools on your toughest jobs. You'll quickly see why there are no "equivalent grades" to Carboloy 350 and 370.

Your local Authorized Carboloy Distributor stocks a complete line of Grade 350 and 370 tools, blanks, and inserts. Contact him today. Or for more information on these extra-performance Carboloy steel-cutting carbides, send the coupon below.

11147 E. 8 Mile Ave., Detroit 32, Michigan

'Carboloy'' is the trademark for products of the arboloy Department of General Electric Company

Send me information on:  Grades 350 and 370  Carboloy Toolholders  Name	steel-cutting carbides	
Company	Title	
Address		

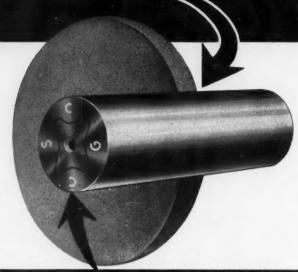
Zone State

An exclusive GRINDING PROCESS...

makes

### CUMBERLAND STEEL BARS

concentric, straight, smooth & really accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

### **CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES**

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is carefully tested before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

#### MANUFACTURED IN THREE SPECIFICATIONS

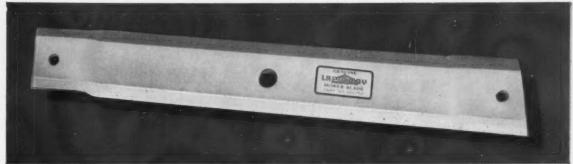
Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

## CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

**ESTABLISHED 1845** 

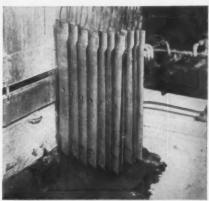
INCORPORATED 1892



Cutter blade of Crucible alloy steel.



First step in manufacture of cutter blade. Crucible beveled blade alloy steel is fed through this 100-ton press, where it is cut to length and holes punched.



Next, lengths are formed to shape on a hydraulic press, and then given a tempering bath as shown.

## CRUCIBLE ALLOY STEEL cuts blade damage in rotary mowers...



Rotary lawnmower cutter blades, whirling at high speeds, often hit small rocks or bits of trash. Ordinary steels just can't take that sort of rugged treatment. They chip, crack - wear out far too quickly. That's why in leading mowers, like the new Lawn-Boy, you'll find special alloy steel cutter blades designed for reliable performance.

For Crucible has developed a special alloy steel made to give the best possible combination of toughness and hardness for long-lasting edges-and formability and ductility for ease of manufacture. It's been so successful that Crucible is now the largest producer of lawnmower steels.

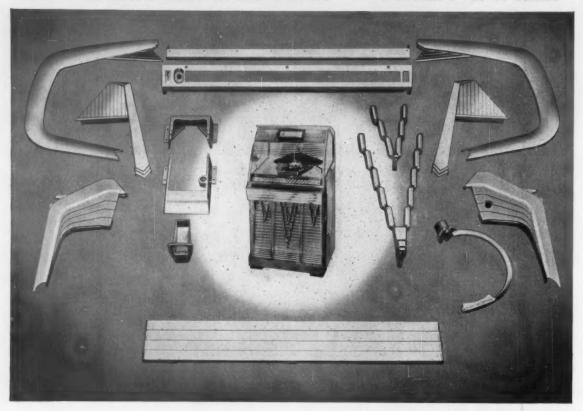
Most Crucible steels are designed to fill special needs. If you have an application where ordinary steels won't do, come to Crucible. Take advantage, too, of the dozens of technical booklets and data sheets Crucible has prepared to help you make the best use of special steels. For a free publication catalog, write Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-99



# ease of assembly for ROCH-OLA

Much of the cost and many of the headaches involved in turning out a product like a coin operated phonograph are centered on the assembly line. Rock-Ola engineers, like those in many other fields of product engineering, minimize their assembly problems through the well-planned use of ZINC Die Castings.

The castings shown here comprise most of the exterior trim on the latest Rock-Ola Hi-Fidelity music maker. Because the unusual shapes can be die cast, the eyecatching decorative effects—highly important to the success of this product—are achieved with an absolute minimum number of components.

Since all ZINC Die Castings in

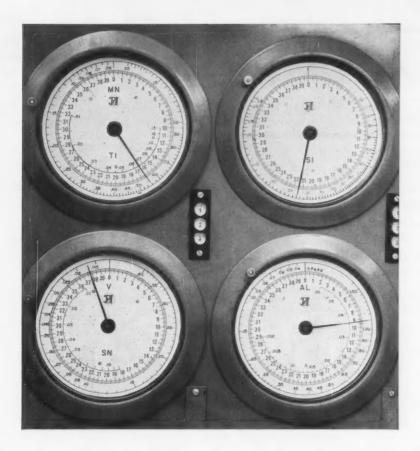
a long production run are identical in size (with precisely located fastening elements) assembly is rapid and trouble-free. Furthermore, the smooth, as-cast surfaces of ZINC Die Castings require no special preparation prior to the application of beautiful, durable chromium plate by standard finishing procedures.

Other important reasons for the evergrowing popularity of ZINC Die Castings will be covered in this space in the months ahead. Send for a copy of our brochure and contact any commercial die caster for the answers to your particular production problems.



The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC



# We see what's in TIMKEN® steel while we make it, to give you greater uniformity in your forgings

You see above four of the twelve spectrometer dials used to analyze steels being melted at the Timken Company. In just 40 seconds this direct-reading spectrometer tells the exact chemical composition of a heat of Timken fine alloy steel. Results are flashed back to the furnace so the melter can keep close control of the analysis. This carefully controlled chemistry produces uniform composition from heat to heat. You can be sure that forgings made from Timken® forging steels will give you uniformly high ductility and resistance to impact.

And because your order of Timken forging steel is handled individually in our mill we are able to target our conditioning procedure on your particular forging requirements. This minimizes your rejects.

Here's an added plus: Timken steel forging bars save you steel because their good dimensional tolerances produce uniform weight multiples with a minimum of steel lost in flashings. Get all these results in your forging steels. Specify Timken forging steels. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD-THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-101

# HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

#### It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

#### It saves money in plating shops!

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

#### FREE

For more information about how Oakite Rustripper eliminates operations in paint shops and plating shops, send for one or both of the illustrated booklets listed in the



OAKITE PRODUCTS, INC. 26 Rector Street, New York 6, N. Y.

Send me free booklet checked below:

- \_\_ "Here's the best shortcut in the field of organic finishing"
- "Here's the best shortcut in the field of electroplating"

Address\_

#### Paint Shop Men Save Time With New Kind of Stripper

INDIANA: "We formerly stripped TV cabinet rejects in 25 minutes. They came out a brown tarnished color... Had to pickle to remove phosphate coating... Today Oakite Rustripper strips the same cabinet in less than 10 minutes, bringing it out so bright and clean you can't tell it from a new one... Pickle, neutralize and rinses eliminated."

NEW YORK: "It used to take two hours to strip synthetic enamel from these rejects (filing cabinets). Now Rustripper does them in about two minutes. We used to soak conveyor chain links overnight and work hooks for several days. Rustripper does both jobs in two hours and cuts out the wire brushing for rust."

**COLORADO:** "We were amazed at the results...a perfect job of stripping gray OD enamel, red oxide prime and surface rust from bomb clusters. Oakite Rustripper is the finest material ever used here."

Send for free booklet "Here's the best shortcut in the field of organic finishing." See coupon at left.

## Electroplaters Find Profit in Alkaline Derusting

california: "Formerly sand blasted the heat scale off these aircraft parts. Now the scale is removed in about 30 minutes with a boiling soak in Rustripper at 4 pounds per gallon, rinse, reverse-current clean, rinse; followed by cyanide dip and cadmium plate."

NEW YORK: Removing heavy heat-treat scale, rust and soil from steel aircraft parts before cadmium plating. Also cleaning stainless steel landing gear parts after hardening. Using 3 pounds Oakite Rustripper and 10 ounces sodium cyanide per gallon at 120°F. with periodic reverse current. "An excellent job is being done... Parts are being descaled that we couldn't touch without pickling in muriatic acid... Everyone astounded at life of solution, since this bath is worked very hard and former bath required heavy upkeep... Appears likely to save about \$2000 in first year."

**CALIFORNIA:** "Oakite Rustripper seems to be what hard chrome platers have been waiting for." Used for removing rust from steel shafts after chrome plating, baking, machining, etc., and before oiling. Rust was formally rubbed away with emery paper.

Send for free booklet "Here's the best shortcut in the field of electroplating." See coupon at left.



# Tool Steel Topics



On the Person's County I amounts in processory and so

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Expert Distributors



### Blanking Die of Lehigh H Produces 15,000 Shotgun Hammers Between Grinds



A minimum of 15,000 shotgun hammers between grinds, with occasional runs as high as 20,000—that's the kind of performance they're getting with Bethlehem Lehigh H in a blanking operation at Milford Tool & Die Co., Milford, Mass. And the operation isn't easy, for it involves an intricate section, heavy weight of stock, and heavy scale condition.

The die is hardened to Rockwell C 59-60, and operates in a 70-ton press. It blanks 8620 hot-rolled alloy steel,  $\frac{1}{4}$  in. thick, the finished part looking much like a piece to a jigsaw puzzle. From 0.004 to 0.006 in. is removed in redressing.

Lehigh H is our special-purpose high-carbon, high-chromium tool steel. It is easy to machine, and undergoes minimum distortion in heat-treatment, resulting in high compressive strength. Lehigh H is a deep-hardening steel. It has good wear-resistance, and is safe for intricate dies having sharp corners.

If you would like to try Lehigh H in your shop, you'll find your tool steel distributor anxious to be of service. Call him at any time. Lehigh H may also be obtained direct from our mill depot.

### NEW COLOR FILM ON TOOL STEEL

You'll like our new educational motion picture, "Teamwork." The film takes you behind the scenes in describing the manufacture, quality-control, heat-treatment, and end-uses of Bethlehem carbon, oil-and air-hardening, shock-resisting, hotwork, and high-speed tool steels.

"Teamwork" is in color, with sound. It is on 16-mm film, and has a running time of 30 minutes. It's ideal for showing to distributors, die-makers, machine-tool manufacturers, heat-treaters, machinists and technical societies, as well as engineering students.

If you would like to borrow a print, write to Publications Department, Room 1000, Bethlehem Steel Company, Bethlehem, Pa., selecting a showing date as far in advance as possible.

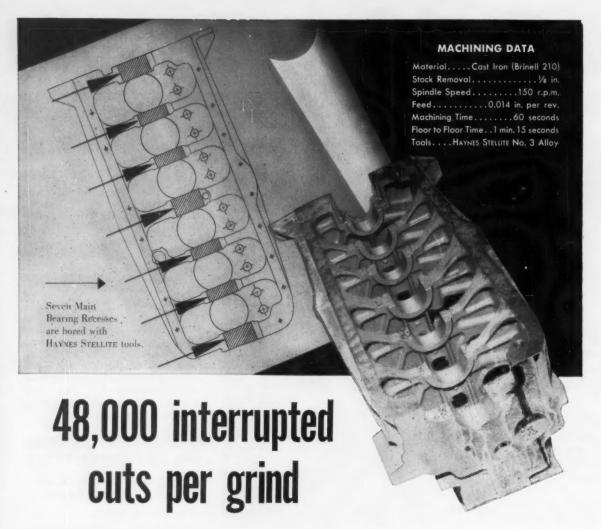
### BETHLEHEM TOOL STEEL ENGINEER SAYS:



Multiple Tools Improve Hot-Work Tool Life

All hot-work tools are subject to heat-checking, a type of surface-deterioration consisting of shallow cracks, usually in network form, which lengthen and enlarge gradually during service. The cracks stem from the repeated thermal stress set up each time the tool is used. During use, portions of the tool surface are heated rapidly by contact with the work, causing expansion; subsequently natural cooling, or some type of forced cooling, causes contraction. Repeated cycles of expansion and contraction produce stresses which lead eventually to heat-check cracks which shorten tool life.

If multiple tools are used alternately, the severity of thermal stress in each operation is decreased, thus retarding heat-checking, and lengthening tool life. A typical example is in hot-piercing punches. Often as many as six punches are provided, and used alternately in a rotating fixture which permits rapid placing and removal of the tools. The life of each tool is often doubled in this manner. However, wherever multiple hotwork tools are used, some degree of improvement in tool life may be expected.



HAYNES STELLITE tools machine the main bearing recesses in 320 cast iron engine blocks between grinds. Each of 14 tools used in the set-up makes 150 interrupted cuts in each block . . , a total of 48,000 interrupted cuts per grind. The tools remain in operation for a full eight-hour shift, without chipping or spalling. Other tools tested on this job chipped under the constant hammering of the intermittent cuts, and had to be replaced in less than an hour.

Standard tool bits 3% in. square and 2 in. long, made of HAYNES STELLITE alloy No. 3, are used for this operation.

Only 0.015 in, of metal has to be removed when the tools are sharpened, and the tools can be reground about 30 times. Then, when they are too short to be used for boring the main bearings, they are used to machine the smaller cam bearing recesses. In this second operation the same tools can be reground about 50 times more!

There are four grades of HAYNES STELLITE metal-cutting tools varying in hardness, compressive strength, and impact resistance. For a complete description of properties, sizes, and recommended operating data, write for the free booklet, "HAYNES STELLITE Metal-Cutting Tools."



#### STELLITE COMPANY

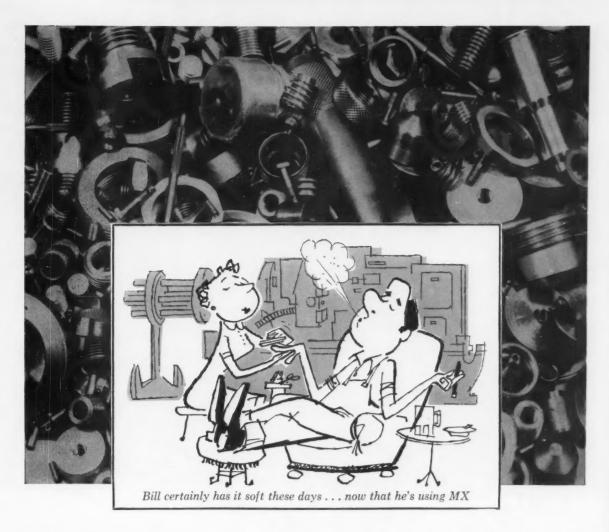
A Division of Union Carbide and Carbon Corporation

THE

General Offices and Works, Kokomo, Indiana

Sales Offices
Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation



Life can be beautiful!

When parts are coming off the machine faster than ever before—when your tools are lasting up to twice as long between grindings—when you're getting clean, sharp, accurate finish right along—when your production is up and your costs are down—in other words, when you're running on USS Free-Machining MX, life can indeed be beautiful.

Hundreds of shops that have put this high speed, fast cutting bar stock to work in the past five years have proved this to be true. And, almost without exception, cost savings have been recorded. That's because MX, despite its better performance, actually costs no more than ordinary screw stock. So when you get more parts per hour, with fewer rejects and less tool grinding, such cost reductions are clear savings. These savings have averaged between 10 and 15%—have sometimes run as high as 40% or better.

Prove this for yourself. Switch to MX. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trademark. In hotrolled form, MX is available direct through our nearest district office.

UNITED STATES STEEL CORPORATION, PITTSBURGH AMERICAN STEEL & WIRE DIVISION, CLEVELAND COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

UNITED STATES STEEL SUPPLY DIVISION WAREHOUSE DISTRIBUTORS, COAST-TO-COAST UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output . . . longer tool life . . . fewer rejects



-when you do the job with free-machining



UNITED STATES STEEL

# can solve YOUR *Wear-Resistance* problem



RAZOR DIE PARTS preformed of CARMET Sintered Carbide

# Write for Your Copy of the

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. Write for your copy.

CARMET CATALOG

ADDRESS DEPT. M-74

### WHAT JOBS HAVE YOU for CARMET CARBIDES to do?

For maximum wear, save with Carmet-preformed to practically any shape or size! Examples: entire blanking die parts; inserts for drawing, heading, extruding and blanking dies; gauge and wear parts, pins, bushings, etc. They can be supplied *preformed*—with minimum grind stock allowed-or precision ground and ready for use. Let us work with you . . . send us your drawings and specifications for quotations. Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Avenues, Detroit 20, Mich.

For complete MODERN Tooling, call Allegheny Ludlum







# THE DIFFERENCE... Carpenter stainless uniformity

These hinge pivot pins for automatic dishwashers were being turned out by "doing things the hard way." Tools had to be reground every eight hours. The ordinary Type 303 steel used wasn't uniform, refused to hold size, and didn't provide the required finish.

This job could easily have been chalked up as a "necessary headache," but someone wasn't satisfied . . . was willing to explore the possibilities for improvement. As a result, Carpenter Stainless No. 8 (Type 303) has brought these worthwhile changes: Tool regrinding is required only every 18 to 24 hours . . . final grinding of the part is eliminated because size tolerances were held so accurately . . . bar after bar machines the same . . . and each part now costs 50% less.

Build your own improvement program with the co-

operation of Carpenter . . . originator of the first Free-Machining Stainless. The steel can be in your plant almost immediately if you call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now. The Carpenter Steel Co., 105 W. Bern St., Reading, Pa.

Specify Carpenter...
the one stainless job-proved to give you:

easier machining fewer rejects smoother finishes lower production costs

Carpenter | |



Free-Machining Stainless Steels

IMMEDIATE DELIVERY from local warehouse stocks - Export Address: Port Washington, N. Y. - "CARSTEELCO"

# TORTURE RACK for finishes

# ...helps improve industrial primers

The old saying, "proof of the pudding is in the eating" describes the durability tests employed at Lowe Brothers. Conditions closely duplicating those in actual service are a vital part of testing all new finishes as well as the continual improvement of existing products.

A recent product development program carried out by our Technical Department is a good example.

Extensive tests were made on many types of pigment materials to develop a superior industrial primer. The result—ZINOXIDE—a primer with highly superior corrosion inhibiting properties ideal for the surface protection of forgings, castings and sheet steel products.

For the best industrial finishes, call or write Lowe Brothers, 424 East Third Street, Dayton 2, Ohio

The durability or weather test, subjects paint test panels to direct sunlight, rain, wind and extremes of heat and cold. ZINOXIDE primer used on the right hand panel, withstood 14 months of exposure, proving highly superior corrosion inhibiting characteristics when compared with the best of other primers used for the same service.

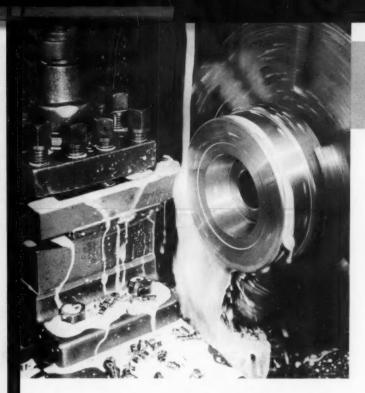
The other sample, at left, developed considerable corrosion on the undersurface.

Lowe Brothers

INDUSTRIAL FINISHES

also Style-Tested paints for the home

A STATE OF THE STA



# carbíde

With volume way up WESSON cuts prices up to 42%

# Big Swing to "No Grind" Inserts Cuts Holder Prices

So big has been the demand for Wesson Multicut no grind carbide insert holders that price cuts up to 42% have been made possible without sacrificing a single one of the premium features that has made these holders the recognized quality leaders in the field. The cuts average 32 per cent with reductions on individual holders ranging from 23.8 to 42 per cent. Of interest is that the cuts come at a time when almost all items made of steel are going up in price.

Industry's overwhelming acceptance of these premiumfeature holders has enabled Wesson to adopt large volume manufacturing methods with resulting major savings. "By passing on these manufacturing savings to our customers, we expect a still further expansion in applications," says W. B. Duncan, Wesson's board chairman.

Six different basic styles of holders are standard in the Multicut no grind series with a total of 39 sizes available. These holders which allow quick indexing of the insert to present a new, sharp cutting edge and thus do away entirely with tool grinding are already being used on thousands of turning operations including internal boring and chamfering, straight and vertical turning, internal and parallel facing, etc.

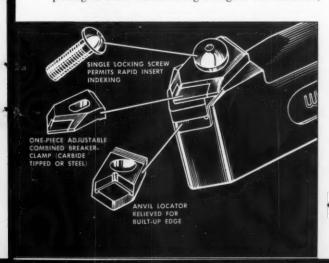
### All Premium Features Retained

Every feature which has made these Wesson tool holders the leaders in the no grind carbide insert field has been retained in making the price cuts. These include Wessons' exclusive one-piece clamp-breaker construction, adjustable chipbreakers and precision cast anvil-locators with relieved seats to clear built up edges when indexing. The single-screw lock for the chipbreaker allows indexing without dislodging the chipbreaker—particularly important feature when indexing holders used in upside down or similar positions. Clearance angles of holders are also larger than usual, permitting application on more types of jobs including internal operations.

The holders eliminate all tool re-grinding, reduce inventory of special holder parts, and greatly reduce down-

(continued on page 2)

Sketch of one of the Multicut holders for no grind inserts showing some of the premium features



### carbide

### Big Swing To "No Grind" Inserts

(continued from page 1) time for tool changes. Setup time is also less.

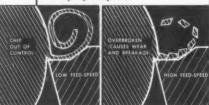
Complete details of the Multicut series for no grind inserts are contained in the reprint "New Trend in Carbide Tooling" and in illustrated bulletin No. 5510-M. Both are available from Wesson. The holders will be the "ASTE Blue Ribbon" feature in Wesson's Booth #450 at the Tool Show in Chicago, in March.

### New Breaker Guideis Industry First

Industry's first comprehensive guide to mechanical chip-breakers for no grind inserts will be issued shortly by Wesson Company. The company's Research Division is now analyzing the results of a broad range of laboratory and practical shop tests.

"This new guide, we believe, will be highly useful to every size shop now doing or planning to do machining with 'throw-away' insert tooling," says W. B. Bader, research division head.

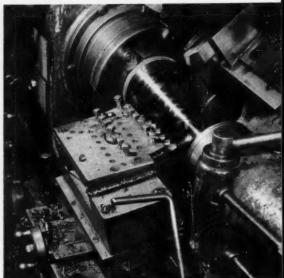
The new guide will reveal the ACTUAL effective range for specific chip breaker dimensions at various speeds and feeds. To obtain the basic data, tests have been conducted on all of the most commonly used steels. Test findings and recommendations are being illustrated and simplified for everyday shop use.



Wesson's new guide will tell how to avoid conditions like these with insert tools

Copies of the forthcoming guide may be reserved now by writing to Wesson Company, Dept. AD, 1220 Woodward Heights Boulevard, Detroit 20, Michigan. Ask for "New Chip Breaker Guide." Copies will be mailed immediately after printing to all advance requests.

# Tool Costs Tumble from 9° to 2° per Piece With Wessonmetal "26"



Eight "26" brazed flat tools and one Multicut insert holder cut tool cost of rough turning and facing alloy steel stem gear

Significantly lower tool costs and a nearly doubled production rate were results of a switch to Wessonmetal "26" carbide in a large eastern gear manufacturing plant. The comparison was with several steel cutting types and grades previously used.

The operation consists of facing and rough turning 32 Rockwell C alloy steel stem gears on a 20-in. Fay automatic lathe. The multiple tool setup used eight Wesson brazed-type flat tools tipped with grade "26" and one Multicut holder.

Formerly, the job was done at 525 rpm and 270 sfpm but it was found possible to boost this to 580 rpm and 305 sfpm with Wessonmetal "26" while getting far better tool life. Depth of cut now averages 3/16-in. As a result, one-fourth of the machining time has been chopped off (now 1½ minutes). This,

plus the lower down time for tool change with longer tool life has nearly doubled hourly production (from 30 pieces per hour to 50).

Savings with Wessonmetal "26" came from 4 sources: (1) The larger number of grinds possible (9 to 10 vs. 4) due to reduction in edge wear and breakage, (2) more than doubling the pieces per grind, (3) fewer tool changes required, and (4) higher output per hour.

Pieces per grind with Wessonmetal "26" ranged from 125 to 175. This compares with 60 to 70 per grind with other carbides. However, grade 26 tools only showed a normal .014 wear after 175 pieces as against far greater stock removal per grind previously. Total pieces per tool ranged up to 1400 for Wessonmetal "26" as against an average of 280 formerly.





NOTHING LIKE A REFRESHING DIP...and when unplated Vaco Screwdrivers take this dip in Cities Service Anti-Corrode, they're fresh for the next 12 months...com-

pletely protected against rust and corrosion. Brand new finish, brand new sales appeal. Vaco operates world's largest plant exclusively for manufacturing of screwdrivers.

### Screwdrivers take bath that lasts a year!

Bath in Cities Service Anti-Corrode Protects

Vaco Screwdrivers Against Rust for 12 Months

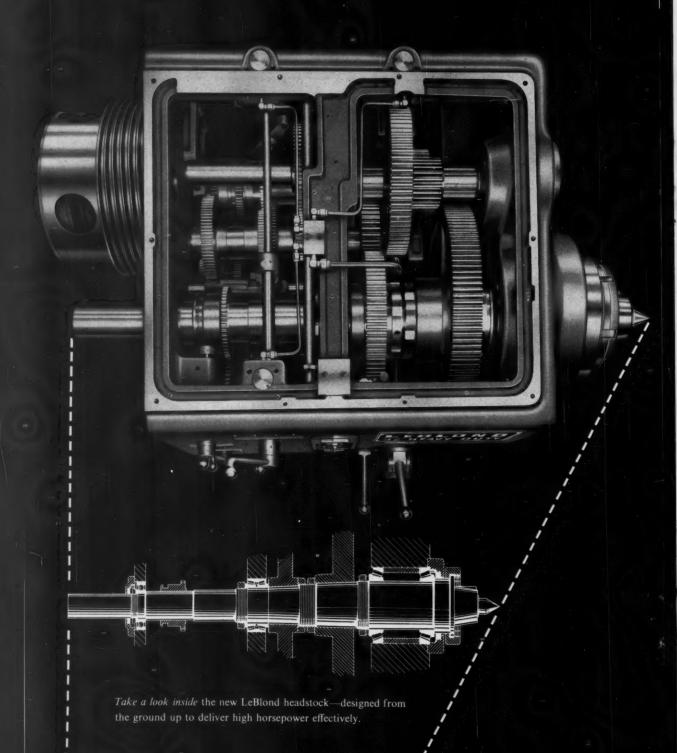
The Vaco Products Company of Chicago, Illinois operates the world's largest plant devoted exclusively to manufacturing screwdrivers. Obviously, they cannot afford rust...whether screwdrivers are in storage or en route to a customer...this is particularly true of special orders for those blades which are not plated.

That's why Vaco uses Cities Service Anti-Corrode #27 on these special order blades. They've found this unusual product prevents rust during transportation and storage.

Whether you're concerned with storage, protection en route or product display, you'll find Cities Service Anti-Corrodes the ideal rust preventives for your business, too. For information, contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



# **Designing LeBlond lathes for**



# 60·HP turning was an inside job

# This new headstock is the power secret of the LeBlond 32" Heavy Duty.

Notice how short and heavy the shafts are—to minimize deflection. Look at the fine-pitched, wide gears—for better tooth action and greater load-carrying capacity. They're hardened and ground for all speeds except low back gear. Free-running spur gear design assures minimum no-load friction horsepower. Shafts and gears not needed for a given speed remain idle, do not consume any power. The new 4-bearing spindle gives maximum rigidity, has twin Timkens at front, double-row Timken at center, ball bearing at rear.

Of all the lathes in the world, the LeBlond 32" Heavy Duty was selected by a leading manufacturer of carbide tools, to be modified for grueling laboratory tests. Using 125 hp drive,

cuts were made with a measured 118 hp at the tool—210 cubic inches of SAE 1045 removed per minute!

Results like this call for a machine built in every detail for high-horsepower turning. The new headstock design is typical of the engineering in every element of the new LeBlond 32" Heavy Duty. The totally-enclosed quick change box, the hardened rack, 4-directional power rapid traverse, hardened and ground steel bedways, thrust-lock tailstock.

Whatever your turning needs—high power or high production, small swing or large—LeBlond makes a lathe you can trust with the job. 76 different models to choose from. Today, see your LeBlond Distributor or write—

36 speeds, new adjustable acceleration. From 4.5 to 500 rpm. New and exclusive adjustable acceleration brings heavy work pieces up to speed safely; any percentage of full torque can be selected for the first five seconds. Similar adjustments can be made for stopping and jogging, by means of three rheostatic controls to the electric clutch and electric brake. Hydra-Trace duplicating attachment optional. Write for Bulletin HD-165 for full details.



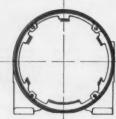
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

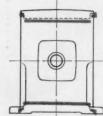
WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES . FOR MORE THAN 69 YEARS

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-113







#### MACHINING NECESSARY

**Drill 8 holes** Chamfer 8 holes Tap 8 holes

Bore two inside diameters Rough face ends Remove chips

or problems in Drilling, Boring, Facing and Tapping

ell a Natco Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Park DETROIT, 10138 W. McNichols Rd. . BUFFALO, 1807 Elmwood Ave. NEW YORK, 35 Beechwood Ave., Mount Vernan

## **NEW NATCO HOLEWAY**

cuts costs and increases production ... and accuracy by combining operations!



# 30

PARTS PER HOUR

#### **OPERATIONS**

STATION No. 1 Load 1 part. STATION No. 2

R. H. Horizontal Head Combination rough bore for 10.492/10.490 half thru, rough bore for 12.064/-12.062 diameter, finish bore 10.520/10.510 diameter and rough face end.

L. H. Horizontal Head Drill 4 holes STATION No. 3

STATION No. 4
R. H. Horizontal Head

Drill 4 holes
L. H. Horizontal Head
Combination rough bore

Combination rough bore for 10.492/10.490 diameter rough bore for 12.064/12.-062 diameter and rough face end.

STATION No. 5

STATION No. 6

R. H. Horizontal Head Tap 4 holes

L. H. Horizontal Head Tap 4 holes

STATION No. 7

STATION No. 8
R. H. Horizontal Head

L. H. Horizontal Head Finish bore to 10.492/10.490 diameter thru.

STATION No. 9

Blow chips out of center bore and 8 tapped holes (4 each side) and blow chips off top. STATION No. 10

Unload 1 part. Part to be unloaded onto gravity conveyor.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

(NATCO)

RICHMOND, INDIANA

# CLAUSING VERTICAL

# are perfect for all milling operations within their capacity!"



The Heart of the CLAUSING MILL is its rigid, high precision spindle head. It has 7 ball bearings—spindle is chrome nickel steel, hardened and ground — quill, ground and hard chrome plated, has full-length honed bearing seat—overarm is an electric furnace casting, with ¾" thick walls, precision ground.



The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream and shape at all angles with one set-up. Quill has micrometer depth control stop and two feeds, lever and hand wheel. Grazale Tool and Gauge, Inc., East Detroit, Michigan, specialists in experimental work on precision aircraft and automotive parts, and on three-dimensional cams, have this to say about the Clausing milling machines: "Clausing mills are perfect for all milling operations within their capacity. We like them especially well for small-parts work— they are accurate, sensitive, easy to set up—and, they are economical in that they eliminate tieing up larger, more costly machines on small-parts operations."

The New CLAUSING VERTICAL MILLER is a precision machine tool designed for jig, die and fixture making . . . pattern, experimental and tool room . . . and general production milling. Many new and exclusive features give it greater versatility and ease of set-up and operation than have ever been available in a miller at or near its price—now only \$795.00, F.O.B. Factory. Your CLAUSING dealer will gladly give you complete information on this outstanding machine—call him today!

### MOST ACCURATE MACHINE OF ITS TYPE!

The CLAUSING Vertical Miller is the most accurate machine of its type and price! Before it leaves the factory each CLAUSING must pass rigid tolerance tests — such as:

- Top of table perpendicular to column ways, both directions, within .0005" in 8" travel.
- 2. Table top, front to back, square with column ways 0 to .001".
- 3 Table, parallel to turret within .001".
- 4. Spindle square with table, front to rear, within .001" T.I.R. in 5" circle.
- Spindle taper (internal) run out within .0002" at spindle nose.
- 6. Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

### CONDENSED SPECIFICATIONS

Size of Table	
Longitudinal Table Travel	1
Transverse Table Travel	
Vertical Table Travel	11%
Maximum Distance Spindle to Table	11 %
Maximum Distance Spindle to Column	8 3/4
Quill Travel	
Spindle Speeds: Six, 180 to 3250 R.P.M. — No. 7 Brown and Sharpe or	
spindle, Optional - Operates from 1/2 or 3/4 HP, 1725 R.P.M. Motor.	

NOW ONLY 795 F.O.B. FACTORY



the PLUS VALUE LINE

MILLS

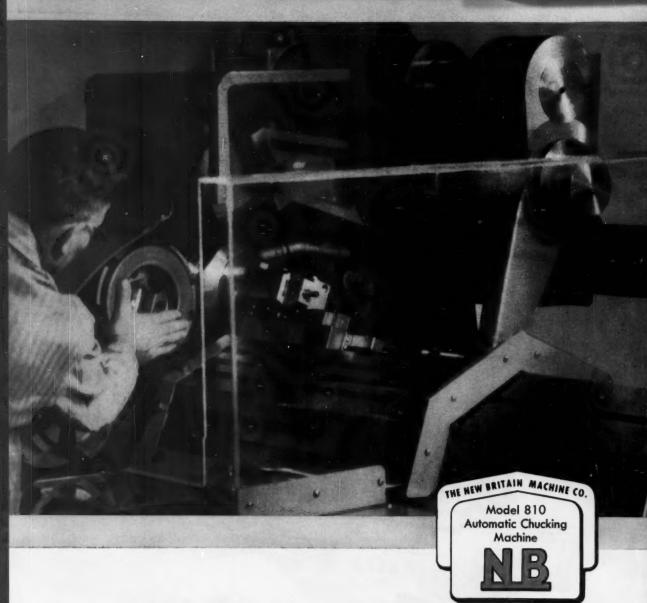
MILLS, DRILLS, BORES, REAMS AND SHAPES... AT ALL ANGLES WITH ONE WORK SET-UP!

CLAUSING DIVISION

Atlas. Press. Company

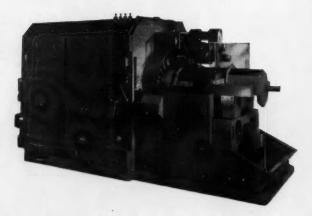
Quality Muchine Tools Since 1911
2-108 N. Pitcher St. 

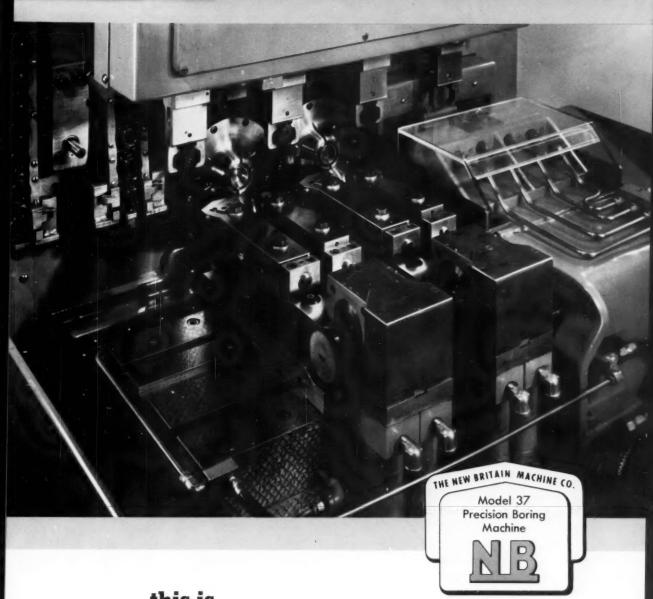
Kalamazoo, Mich.



### size no object

All the advantages of New Britain four, six and eight spindle chuckers now can be applied to your big castings and forgings. Chucking capacity to 15 inches, open-end construction, double indexing for work on both ends and automatic loading where practical, mean more pieces per hour and lower cost per piece. The New Britain Machine Company, New Britain-Gridley Division, New Britain, Connecticut.





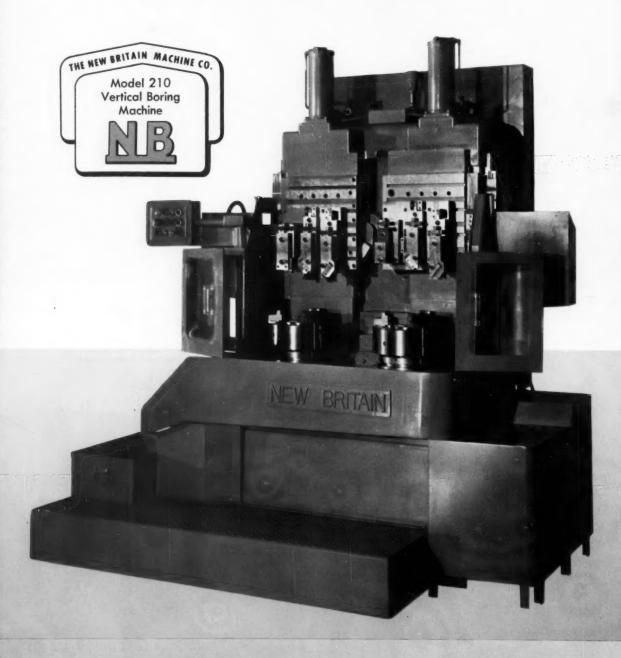
### this is the boring machine that thinks

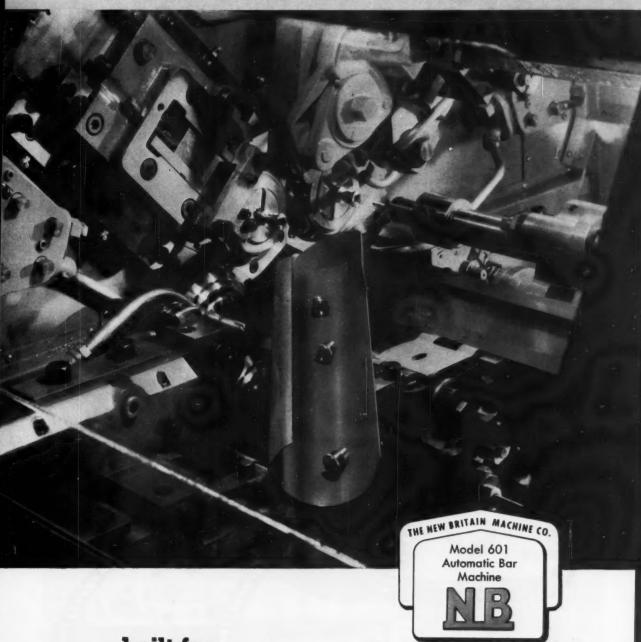
As successive pieces approach the limits of a ±.0025 inch tolerance, the tools reset themselves to size. With automatic loading, automatic gaging and two-at-a-time production, this and other New Britain Precision Boring Machines can cut costs for you. Please turn the page for more about New Britain Boring Machines.



# verticals too!

New Britain builds a complete line of straight and contour boring machines, including double-end models, and this Vertical Precision Boring Machine for contouring and turning large parts to close tolerances. More and more the New Britain Sales Representative is your best bet for new and progressive metal-working methods. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





### built for the carbide age

This rugged, powerful, fast automatic has what it takes to get full mileage out of the tremendous advances in tools. Check with your New Britain man on this big cost-cutting possibility.





monufacture and measurement for mankind

slide film "Machining the Unmachinable." Here is Cavitron in operation. Write to Div. 810-THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.



servo valve

# 5 Waldes Truarc Rings simplify assembly, eliminate parts, bring big over-all savings to new design low-cost camera

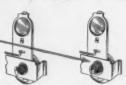
#### Anscoflex II Camera





#### Portrait and Filter Lens Knob Assemblies

Old way: Knob with plastic shaft used washer and heat forming operation that flattened the plastic pin and locked the pivot in position.



Parts originally designed for selflocking Truarc ring (series 5105). Some cameras in the past had brass cup staked to the body. At times staking operation cracked the plastic, resulting in loss of expensive part.

Truarc way: Molded plastic knob with pin is easily and quickly held by a Truarc self-locking ring (series 5105). No groove is necessary. Washer is eliminated and it is possible to remove ring if necessary without damage to knob.

### **Winding Knob**

Old way: With screw and washer design, it was necessary to disassemble entire camera to remove screw which secured winding knob. Self-topping screw sometimes failed to secure knob, produced excessive end play.

Truare way: Truare "E" ring (series 5133) allows removal of winding knob without major disas-

sembly of camera, reducing repair time. Use of stacked rings and Truarc applicator saved \$10.40 per M on labor. Material saving: \$2.29 per M.





#### Rear Lens

Parts originally designed for self-locking Truarc ring (series 5005) Some cameros in the past had glass element secured by heat forming tabs from plastic body. Loose or chipped elements resulted in loss of both parts.

### Flash-Gun Case Assembly

Old way: In the original design a sleeve was wrapped around neck of screw and pressed into hole of plastic cover. Close working areas made assembly difficult and required extra operation to lock ring into place.





**Truarc way:** Series 5133 E-Ring snaps onto unthreaded shank of screw quickly, needs no special groave. Labor saving \$7.06/M.

Ansco, Binghamton, N. Y., uses the latest technical advances in construction to produce an economical, easy-to-use reflex camera. 5 Waldes Truarc Rings are used in this new design to save material and labor costs, eliminate parts, simplify assembly and reduce rejects.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality con-

trolled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



Send for new catalog supplement

TRUARC

RETAINING RINGS

Waldes Kehlmeer, Inc., 47-16 Austel Place, L. I. C. 1, N. Y. Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.

(Please print)

Title

Company

Business Address.

City

Zone\_\_State\_\_\_\_\_Mags

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.



# High Speed Production Grinding DEMANDS more than just a Coolant!

High speed production grinding has made just coolants obsolete! Today's water-mix grinding fluid must provide lubrication, heat dissipation qualities, anti-rust protection and balanced surface tension. If you're using "just a coolant," it's costing you extra money!

Stuart's CODOL is a carefully designed liquid grinding compound that is far more than just a coolant. CODOL has been scientifically compounded to

provide far more detergency than ordinary water-mix grinding fluids. Wheel loading is greatly reduced and allows more pieces to be ground per wheel dressing.

CODOL's carefully balanced surface tension insures the carrying away of chips and abrasive particles from the wheel, work and machine. Surface finish is improved, production is increased and good wheel life is obtained. To be sure that you consider all of the important points, such as ease of mixing, resistance to rancidity, gumming and foaming, when selecting a water-mix grinding fluid, ask "the Man in the Barrel," your Stuart Representative, to call and help you. And write today for your copy of the Stuart Water-Mix Cutting and Grinding Fluid book.

D. A. STUART OIL COMPANY, LTD. 2739 S. Troy St., Chicago 23, III.

More than a "Coolant" is Needed

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

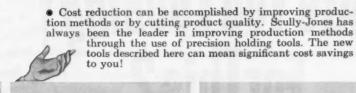


Stuart Oils

Time Tested Cutting Fluids and Lubricants

### **NEW** Scully-Jones Tools for low-cost

### DRILLING AND TAPPING





Drive large taps with ease and accuracy with the improved heavy-duty tap holder. Also useful for driving reamers, staybolt setters, flue expanders and similar tools.



These compact, sturdy tools offer trouble-free performance on close center and "hard-to-reach" tapping operations. Accuracy is assured because driver and chuck run true within .002 in.



Used on multiple spindle machines, these tools compensate for variations between spindle feed and tap lead. They eliminate costly feed changes, assure accurate tapping.



When driving straight shank drills, this new fourslot design greatly increases resistance to pullout. Greater protection is provided against tool breakage and downtime.



Four-slot design provides collet action which grips the top tightly and greatly reduces danger of pull-out. Accurate tapping is possible on very close centers.



Designed for driving combined center drills and countersinks, this tool has an offset splined section which gives a positive drive in the drill flutes and protects the cutting edges.





# Are You Looking ForThis?

New method of gravity flow and magnetic attraction. Smaller filter .

greater flow capacity.

Greatly increased magnetic attraction. 25-50% less floor space required.

More complete filtration.

Greater swarf load capacity. Reduced operating costs.

Out-performs all present units.

MOST EFFICIENT, MOST **POWERFUL MAGNETIC** 

Delpark's

Patents Pending

# Combined Magnetic Separator and Filter

CONTINUOUS, FULL FLOW, SELF-CLEANING, FULLY AUTOMATIC FOR THE REMOVAL OF FERROUS SLUDGE AND ABRASIVES FROM COOLANTS

Delpark

FIRST in Filtration Advancements

BACKED BY MORE THAN 40 YEARS EXPERIENCE IN INDUSTRIAL FILTRATION

UNEQUALLED IN EFFICIENCY . . . gives filtration performance never before possible on production work. The only separator using gravity flow of liquids on top of the greatest magnetic power giving benefit of both gravity and magnetic separation. Reduced filter size . . . 25 to 50% LESS FLOOR SPACE REQUIRED.

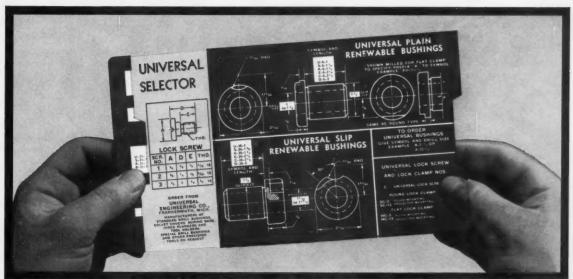
Write for more detailed information.

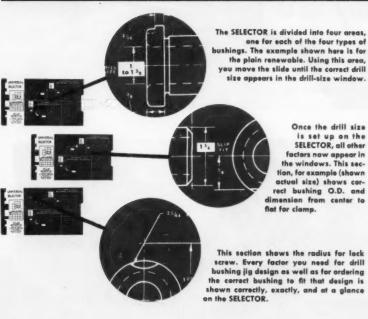
INDUSTRIAL FILTRATION COMPANY

LESANON, INDIANA

### **HOW THE UNIVERSAL** DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size





A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't waitdo it today!



193

### UNIVERSAL ENGINEERING CO.

FRANKENMUTH 2, MICHIGAN





DIAL INDICATOR GAGE checks O.D. runout and squareness of face of hobs quickly, accurately, and for much less cost than any other gaging system.



AIR GAGES

check I.D. and chordal height of arc-like workpieces. The Dial Indicators check squareness of
faces and concentricity of two diameters. Typical
illustration of how Federal combines gaging
systems to suit requirements.



MULTIPLE DIMENSION "PICTURE PANEL" GAGE checks overall length and five outside diameters of projectiles. Shows off-tolerance parts by flashing colored tolerance lights. Electricators show how much tolerance varies (from nominal).



### It's time to buy the right gage

If you are the one in your organization who is responsible for the dimensional accuracy of the parts that go into the product, chances are you have not given enough consideration to the COST OF INSPECTION.

When you realize it's generally considered good practice to hold inspection costs within 5% of production costs, it's worthwhile stopping to investigate what you pay for inspection. And when actual case tests show that it takes five times longer to inspect a hole with conventional plug gages than with modern indicating gages, then the TYPE OF GAGE you use becomes important.

Too often, a gage is bought to inspect certain dimensions without due consideration of other factors which may be of even greater importance than its ability to gage accurately. Buying any type or system of dimensional gage with a higher degree of accuracy than required . . . and at a higher price, is just poor economy.

The best inspection departments we have known do not let tradition or fly-by-night

practices overshadow consideration of better methods. Neither do good gage buyers blindly accept new gages without carefully investigating the different gaging methods and getting impartial recommendations.

Federal has been making gages exclusively for many years and we have today the most complete line of accuracy-proven, modern gages in the world. This special background of continuous and extended experience in gaging has taught us to analyze and solve gaging problems with certainty and to render sound service to our customers.

Since Federal makes all modern gaging systems, we can be impartial in our recommendations and supply you with whichever system best meets your needs. This can be of distinct advantage to you, for it isn't likely that a salesman will recommend the best system if he hasn't got that system to sell!

There is a Federal representative near you, ready to give you the facts *impartially*.

FEDERAL PRODUCTS CORPORATION
6112 Eddy Street • Providence 1, R. I.

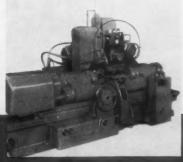
## Ask FEDERAL First

FOR RECOMMENDATIONS IN MODERN GAGES . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging



ELECTRONIC AUTOMATIC SORTING GAGES inspect tubeless tire wheels for radial and lateral runout. Gages are in-process type and are conveyor-fed.

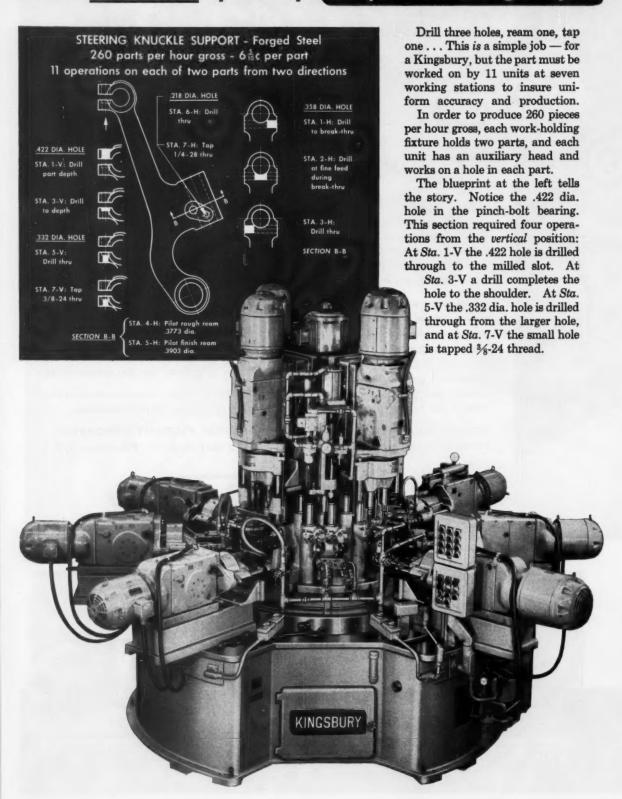


MACHINE CONTROL GAGE
uses Air-Electric gaging system to automatically
control grinding wheel on cylindrical grinder
Gage backs wheel off at finish diameter. Light
indicate approach and final size.



ELECTRONIC CONTINUOUS MEASURING GAGE is used to detect variations in the width of moving picture film after it has been slit into its standard width.

## Where slow-down speeds-up "Operations Kingsbury"



### for greater accuracy and higher production . . .

Now look at Section B-B, the .358 dia. horizontal hole. It has a break-through with the axis hole, and must be accurate. This work is accomplished at five stations. Sta. 1-H drills to the break-through at normal feed. Sta. 2-H drills at fine feed during the break-through. Sta. 3-H completes the drilling at normal feed. At Stas. 4-H and 5-H, pilot reamers rough- and finish-ream the hole to exact specifications.

The .218 dia, hole involves simple drill-thru and tap operations, at *Stas*, 6-H and 7-H.

Each Kingsbury machine is designed and built to achieve three prime objectives: 1) accurate interchangeable parts as specified, produced at the 2) highest practicable production rate, and 3) at a cost per part which will make the machine a wise investment. And each Kingsbury machine proves itself in a trial run before it is delivered.

# Combined operations promote savings in equipment, and lower costs per part

When we designed the Kingsbury machine shown below, we estimated its production at 250 parts per hour gross. We were low: it's producing 308 parts per hour gross, at 2 \(^4\)/10c per part.

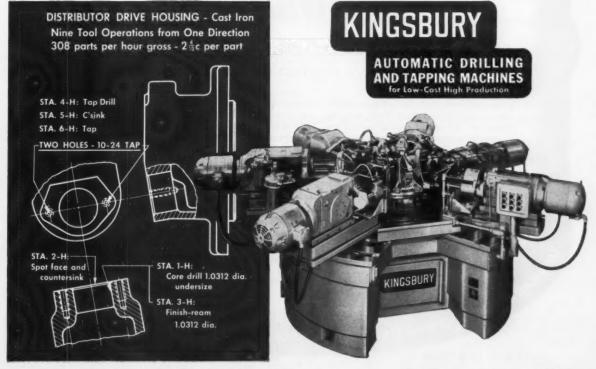
The machine has an 80-inch base on which are mounted six drilling and tapping units. A 24-inch index table with seven work-holding fixtures indexes through seven stations — one for loading and unloading.

All work is performed horizontally. The 1.0312 dia, hole is core-drilled undersize at Sta. 1-H, and finish-reamed 1.0312 at Sta. 3-H. Sta. 2-H spot-faces the joint face and forms countersink.

At Stas. 4, 5, 6, the Kingsbury units are equipped with auxiliary heads and drill, countersink and tap (10-24) the two small holes.

This Kingsbury is a good example of the savings in equipment and time which result when operations can be combined without risking uniformity. And, as is true with all Kingsburys, one of the big "secrets" of its success is the design of the work-holding fixtures. A part must be positioned in a matter of seconds, and held securely at each station, if the work is to be accurate. Therefore, the work-holding fixture is the very heart of a Kingsbury, and it's built with loving care! Perhaps that's one reason why Kingsburys perform so well!

Kingsbury Machine Tool Corp. 115 Laurel Street Keene, N. H.



There's more in this barrel for you.

Dr. R. T. Edwards testing products to fight corrosion caused by fingerprints on precision metal parts.

### MORE CONTINUOUS RESEARCH to help you improve production and cut costs!

When you specify "Socony Mobil," you get petroleum products backed by more continuous research than those of any other oil company! This means products which are continually improved in quality and performance-new products when needed. Equally important . . . these complete research facilities are available to you—to help improve your production and lower your unit costs.

Socony Mobil products are also backed by more field engineers serving industry . . . more services for analyzing petroleum products in use . . . more on-the-job training of your personnel in correct product application . . . more approvals from machine builders . . . more practical experience-90 years!

Always specify Socony Mobil. There's more in every barrel for you!

SPECIFY SOCONY MOBIL



FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

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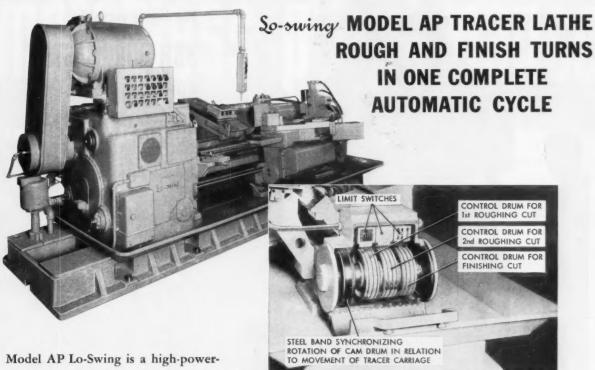
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# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YORK



Model AP Lo-Swing is a high-powered, high-speed, fully automatic Tracer Type Lathe which can be set up easily and can be operated by semi-skilled labor. Since it uses a simple type of master template to reproduce size and profile, it is well suited for small and medium lot production.

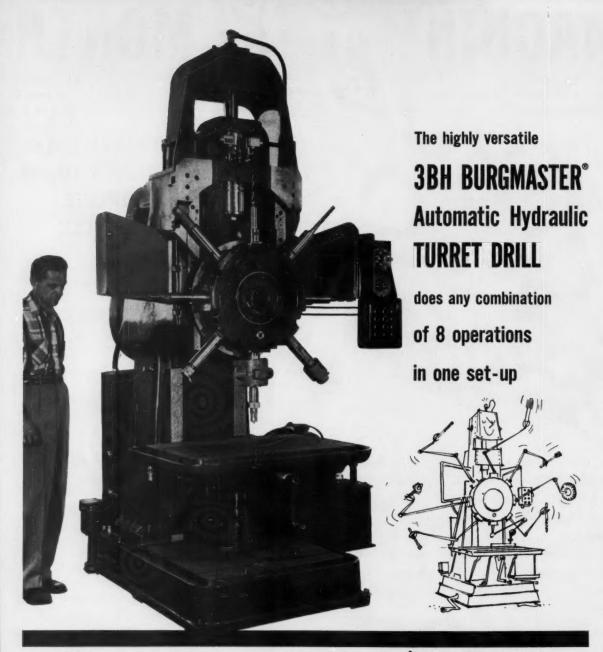
The illustration at right shows the graduated control drums which control all movements of the front tracer carriage and which initiate feed movement for the back squaring attachment when used. Control cams are graduated for rapid setting.

Write for Bulletin APT 56B

### FEATURES OF THIS NEW LO-SWING TRACER LATHE

- Rough and finish machines in one complete automatic cycle.
- Back squaring attachments permit additional facing and undercutting operations synchronized in the machine cycle.
- Rapid traverse movement to the tracer slide advances cutting tool rapidly to the work and also relieves slide on the return stroke.
- Rack and pinion longitudinal feed permits long carriage travel.
- Motors up to 50 HP can be used on heavy roughing operations.

So-swing model AP AUTOMATIC TRACER LATHE



...drilling, reaming, counterboring, countersinking, spot facing, tapping, O. D. threading and numerous other second operations can be accomplished—with one operator—quickly and simply. Metal working plants throughout the country are finding that quality and accuracy of work are greatly improved, while costs drop. The reason is basic. Each tool change is brought to the work. The need to carry or shove, then realign the work manually with resultant time loss, accuracy loss and increased fixture cost, is eliminated. It will pay you to investigate this rugged, precision-built universal machine.

For complete information, write Dept. M-2



BURG TOOL MANUFACTURING CO., INC. 15001 S. Figueroa St., Gardena, California NEW YORK • CHICAGO • SAN FRANCISCO

### Check these features:

Automatic hydraulic - 8 spindle - 1½" drill capacity in mild steel - 12" stroke - 20" throat depth - 10HP motor - infinitely variable preselective feeds - automatic cycling (easily ties in with auto index tables, positioning tables and index fixtures) - pre-selective spindle speeds - pre-selective, extremely accurate depth control - pre-selective length of rapid approach.

### Other models include:

hand operated, 6 spindle; ram type radial, 6 spindle; automatic hydraulic, 6 spindle.

Visit our BOOTH NO. 389
ASTE Industrial Exposition • March 19-23
CHICAGO International Amphitheatre

Vanadium-Alloys Steel Company

# matchless performance

in Die Steels for Cold Work

better toughness

better grain size control

better control of segregation

and

manufacture by specialists in first quality tool steels

exclusively!

### Colonial No. 6 - NON-SHRINKABLE

The non-deforming, oil-hardening steel that combines ease of machining with low hardening temperature. Fine performance on blanking dies, punches, gauges, bushings, etc.

### Air Hard

5% chromium, air hardening with minimum distortion. Provides toughness and better wear resistance for thread rolling dies, forming and blanking dies, knurls, punches, gauges.

#### Ohio Die

High carbon, high chromium alloy, air hardening. Affords exceptional resistance to wear, with long life on trimming die, lamination die, shear blade, coining die, roll, mandrel and other difficult assignments.

### Crocar

Air or oil hardening. A high carbon, high chromium steel, highly wear resistant; properly selected for lamination dies, wear plates, slitting cutters, forming dies.

### **Red Star Tungsten**

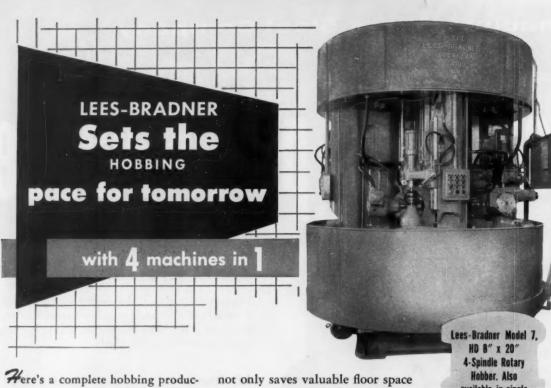
Oil hardening. Unusual edge strength and wear resistance, with high hardness. Specify for taps, punches, spinning tools, slitters, blanking dies.

### **Vanadium-Alloys Steel Company**

Latrobe, Pennsylvania

#### Subsidiaries :

Anchor Drawn Steel Co. • Colonial Steel Co. • Pittsburgh Tool Steel Wire Co. Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni



tion line in one space-saving unit.

Actually the Lees-Bradner Model 7, H D 4-Spindle Hobber is four separate and independently operative machines in one. Each hobbing unit incorporates basically the same automatic, high-production features as the remarkable 7 HD Single Spindle Hobber. This includes a heavier, more rugged headstock, heavy-duty column and a 10 H. P. motor.

This amazingly efficient machine

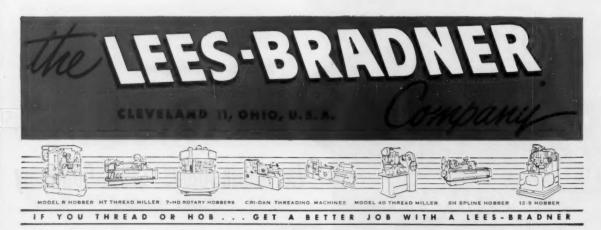
but, with its pushbutton controls and automatic features, actually controls the operator thus reducing the chance for human error or slowdown. Chips and coolant are easily carried away from the headstock by the elimination of flat surfaces.

So, if your manufacturing space is valuable and high unit production important, ask your Lees-Bradner representative to give you the story on the ultra-efficient 4-spindle rotary hobber. Write or wire us direct for his name and address in your area.

available in single and 6-spindle models.



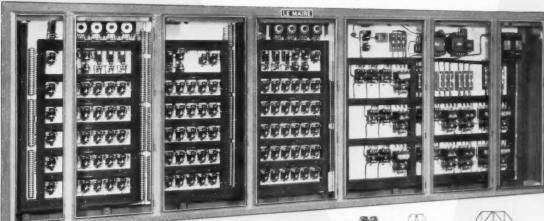
View of new HD headstock with increased bearing surface be-tween column and headstock, heavier casting, coolant and chip carry-away.



# OVER 125 ALLEN-BRADLEY RELAYS, TIMERS and STARTERS

in this LEMAIRE Multiple Station Machine Panel

Bulletin 700 BX Universal relay with 4 normally open & normally closed contacts.



LeMaire multi-station machine operated by panelboard shown above. A good example of Allen-Bradley solenoid controls in the automotive industry.





Bulletin 709 Size 3 starter. Rated 30 hp, 220 v; 50 hp, 440-550 v.



Bulletin 709 Size 1 starter. Rated 5 hp, 220 v; 7½ hp, 440-550 v.



Bulletin 702 3-pole relay with magnetic holdin latch. A hum-free relay. Did you notice the prominence of Allen-Bradley solenoid motor controls at the recent Chicago Machine Tool Show? Manufacturers recognize these reasons...the long, trouble free life of Allen-Bradley motor controls...their unerring precision in operation...the inherent QUALITY of their workmanship and materials.

Machinery manufacturers look to Allen-Bradley as a reliable source of control units and components. The A-B trademark is to them and their customers The Sign of QUALITY in Motor Controls.

Send for the Allen-Bradley Handy Catalog. It is a recognized handbook on motor control. Or, let our control specialists help you with your control problems.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ont.





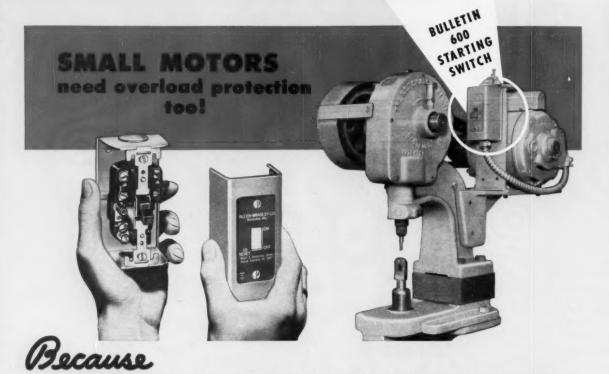
Bulletin 800T oiltight push button with NO & NC contacts.



Bulletin 802T adjustable lever limit switch.







### SMALL MOTORS CAN BE AS IMPORTANT TO PRODUCTION SCHEDULES AS LARGE MOTORS

Here is an outstandingly popular starter for applications using motors of ONE HORSEPOWER OR LESS.

It is a small, manually operated starter that is equipped with a time-tested, reliable A-B overload breaker. A soldered ratchet trips the operating lever in case of a sustained overload. It is reset, after tripping, merely by moving the operating lever to the OFF position. Overload heater elements are available to cover the ratings of this starter.

The Bulletin 600 starting switch is available in single and double pole construction. Its double break, silver alloy contacts provide high interrupting capacity. The contacts are always in good operating condition. They never need to be cleaned, filed or dressed. Please write for a copy of Bulletin 600 for complete information on the Bulletin 600 line.

### SIMPLE



Simple ON & OFF snap switch . . . easy access to terminals . . . ample wiring space . . . silver alloy contacts need no cleaning

### ATTRACTIVE



Streamlined enclosure in grey enamel, and bonderized to assure positive binding of enamel finish to resist corrosion. The pilot light is optional.

### OVERLOAD



According to National Elec. Code ruling, motors of 1 hp or less, automatically started by thermostat, float switch, etc. must have overload protection.

### FITS STANDARD SWITCH BOXES



Bulletin 600 startaers fit any standard 2½ in. deep wall switch box. Can be mounted in machine frame or base. Available with pilot light.

EASY TO



Remove 2 screws on front of start-

on front of starter...slip off cover... attach conduit...pull in wires and connect to terminals... replace the cover.

#### VARIETY OF ENCLOSURES



Type 7 for hazardous loca-







Type 4 with pilot light.

Allen-Bradley Co. 1316 S. Second St. Milwaukee 4, Wis.

In Canada—Allen-Bradley Canada Ltd., Galt, Ont.



ALLEN-BRADLEY

**₹QUALITY**₹



Use a modern lathe—consistent in size with the work to be done. Gain advantage of time-saving features—to reduce operator effort, lessen time between set-ups, permit a faster rate of production!

The Rivett 918 offers this opportunity. Many shops are taking advantage of it. Why don't you?

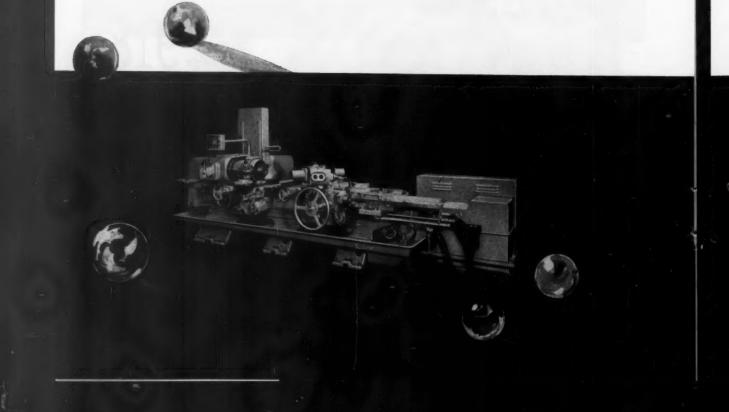
RIVETT

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RIVETT LATHE & GRINDER, INC .- DEPT. MR-2, BRIGHTON 35, BOSTON, MASS.

## CHILD'S PLAY





Speed is not enough! To pay for itself out of reduced operating costs and increased profits, today's machine tool must be:

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Here are a few of the many advanced engineering features which have made today's Jones & Lamson machine tools the most flexible and cost-efficient metal cutting equipment in the industrial world today.

Two-way tracing combined with normal turret lathe operation; Hydra-clutch headstock and Geneva saddle for simple "on the machine" handling; Automatic handling, gaging, chip disposal, sorting, tool adjustment on single spindle automatics; Tape controlled turret lathes for flexibility on long or short run jobs with pre-set tooling, no hand controls; Thread and form grinders with fully automatic handling and machining cycles; Contour grinders controlled hydraulically or optically, and "Automatic thread chasing on standard turret lathes".



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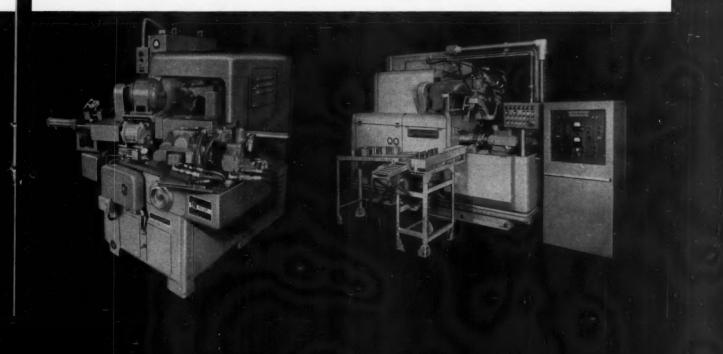
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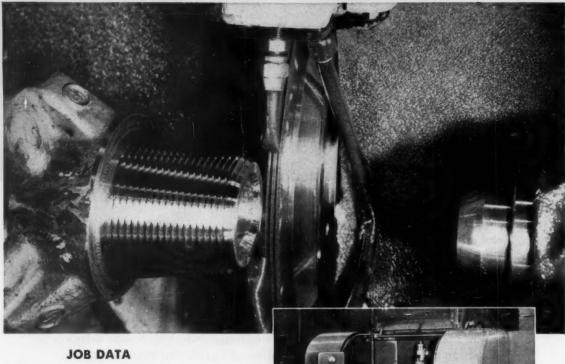
Milling & Centering Machines

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**Optical Comparators** 

Threading Dies & Chasers





Machine: Jones & Lamson Thread Grinder

Part: Rock Bit

Thread: 41/2 API, 5 threads per inch

Steel: 4620

Wheel: Multi-rib Diamond Dress-24" dia. (new)

**Speed:** 1910 rpm (max.)

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Texaco Grindtex Oil. 411 is used exclusively for this one-pass thread grinding job at the Fort Worth plant of Chicago Pneumatic Tool Company. After more than four years' experience with Texaco Grindtex Oil 411, the company reports: (1) excellent wheel performance; (2) highly accurate thread form; (3) fine finish; (4) long oil life; and (5) low operating cost.

Texaco Grindtex Oil 411 is especially suitable for grinding hardened steels where accuracy and fine finish are required and difficulties with surface discoloration and burning must be overcome.

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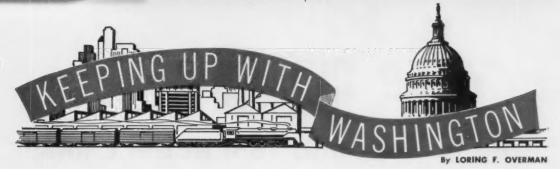
There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do *all* your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

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TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.



#### Congress Concerned about Department Buying Methods

Besides the usual quota of controversial legislation which Congress was ready to tackle when it reconvened on January 3—highways, housing, education, wage-hour extension, and social security expansion—changes in rules for buying military supplies were in the making. Some members of Congress, it appears, are so disturbed by Department of Defense contracting methods that the Senate and House may be called upon to write more restrictive legislation.

#### Negotiation Top-Heavy

Two things are responsible for renewed interest in the purchasing methods employed by the Department of Defense. First, a warming cold war continues to keep defense agencies in a buying mood—to the tune of no less than 35 billion dollars a year. Second, the recent revelation that over a 30-month period ending last June, only 2 billion dollars out of 36.5 billion dollars in Armed Services contracts were handled as advertised competitive bids. Contracts amounting to 34.2 billion dollars were made with exceptions to the Armed Forces Procurement Act.

Observing that he did not believe Congress intended to have exceptions supplant traditional systems of advertised competition in bidding, Chairman Carl Vinson of the House Armed Services Committee said he would recommend a first-class overhauling of the procurement act. The House Committee chairman pointed out that even a 10 per cent saving on the 36.5 billion dollars would have almost balanced the budget.

The report of a special subcommittee named the Air Force as the worst offender with the Military Construction agencies providing the "only relief in the picture." The Air Force, according to the report, negotiated for 99.56 per cent of its purchases between January 1, 1953, and June 30, 1955. Army Engineers awarded 83.5 per cent of their contracts after competitive bids during the same period, and the Bureau of Yards and Docks, 72.9 per cent.

"It seems imperative," said the report, "that Congress review the authority contained in the Armed Services Procurement Act of 1947 if free competition for American business is to be preserved."

#### **Mobilization Planning**

The Department of Defense continues its series of Industrial Mobilization Planning Conferences as a means of interesting potential suppliers of materiel. Initial conferences were held in San Francisco and Los Angeles; a third in Boston on January 10, and a fourth in Philadelphia, January 19 and 20. At these conferences, top mobilization officials discussed military planning, stockpiling, layaways of industrial equipment, industrial preparedness measures, and lead-time schedules.

In addition to the planning conferences, the Army, Navy, and Air Force have been ordered to rush to completion materiel planning studies involving 1000 end items considered critical and given priority in military planning.

#### Machine Tool Enigma

With tomorrow's military decisions depending upon both diplomatic action and the crop of ideas coming from defense planners' drawingboards, the role of the machine tool industry remains uncertain. In 1956, as in previous years, it is impossible to complete the design of a special machine tool until military people have a fairly fixed idea of exactly what the end product of the machine is to be. Currently, air defense and jet propulsion are getting appropriations for both finished products and the production equipment to make them. Guided missiles-with particular emphasis on an Intercontinental Ballistic Missile-are in the testing stage.

The newest proposal in the machine tool field is an order which would authorize the exchange of tools between the services plus regular inspection of stored tools to eliminate obsolete units or packages, and to assign all-purpose tools to needed places in the work force.

#### **Automation Report Issued**

What may prove to be one of the most important reports issued recently in Washington concerns the automation study conducted by a Congressional Joint Economic Subcommittee. The committee, headed by Representative Wright Patman, held hearings for nine days in October, with a wide variety of experts testi-

fying. The report said that evidence submitted to the committee suggests the importance of looking ahead five years or longer, when the fruits of accelerated technological advancement and postwar investment begin to accumulate and compound.

Among official comments of the subcommittee:

"The subcommittee recommends that industry . . . must be prepared to accept the human costs of displacement and retraining as charges against savings from the introduction of automation.

"Organized labor should continue to recognize that an improved level of living for all cannot be achieved by a blind defense of the status quo.

". . . The problems of automation are by no means negligible or settled. This prompts the subcommittee to the view and urgent recommendation that all interested parties should make this a subject of continuing or recurrent study."

#### Atomic Energy Outlook

Senator Clinton Anderson is the latest to prod business and the Atomic Energy Commission to take a broader interest in civilian applications of atomic energy. Senator Anderson feels that the AEC has its dynamic protégé too tightly wrapped in secrecy and red tape. He is recommending that the Joint Committee on Atomic Energy, of which he is chairman, take the following actions:

1. Appraise the present and future impact of peaceful applications of atomic energy to the United States economy and its resources, including employment.

2. Study the AEC activities in its roles of developing and regulating the peaceful uses of atomic energy.

3. Come up with recommendations based on public hearings and a report of a citizens' panel due January 31, 1956, on AEC operations "for any needed revisions of our program for the development of peaceful uses of atomic energy, by both government and private enterprise."

Evidence of industry's rising interest in atomic energy is the fact that 543 "access permits" were issued by the AEC to business firms between April and November 30, 1955. Permits entitle holders to use restricted data in civilian projects involving atomic energy.



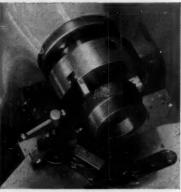
#### "The Outstanding Tool Room Lathe"



Precision Collet work for all sizes to 1-1/16" Collet seats directly in spindle.



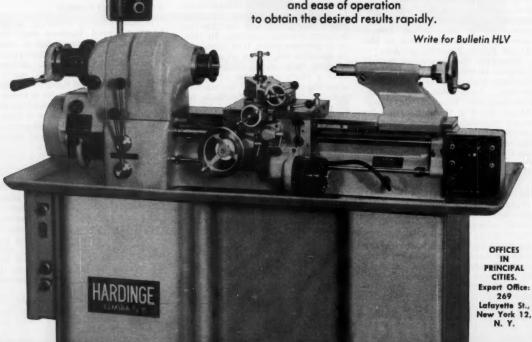
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.

Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

## Clinic for Tooling Problems

THE need for mathematical knowledge and ingenuity on the part of tool designers and toolmakers is now more important than ever with the increased emphasis on automation and automatic methods in production. Mechanisms and components must be created in greater profusion than in the past and a seemingly endless number of mathematical calculations are often necessary.

It is, therefore, almost axiomatic that every capable tool designer must have a working knowledge of geometrical relationships, trigonometry, algebra and descriptive geometry as part of his stock in trade. With such a background, the experienced designer can make use of his ingenuity in applying mathematics to the solution of his problems.

Dimensions on a product blueprint generally control the design of jigs, fixtures, and other production tools and set-ups. Very often, however, the essential dimensions for tools and set-ups that will be required for the manufacture of the product are not evident from the dimensions of the product itself. It is at this point that mathematical know-how enters the picture to provide the answers.

Typical examples are locating points, reference dimensions, and cutting tool positions. In most design problems of this category, graphical lay-outs are useful for checking geometrical relationships and they help the designer to visualize the problem at hand. Such lay-outs, however, should never be used as a substitute for mathematical calculations in cases when the interests of accuracy demand such calculations.

Many occasions arise in the engineering department and in the tool-room where problems are difficult to solve because of inadequate analysis of the factors involved or insufficient knowledge of mathematics. Generally speaking, careful consideration of the problem and application of comparatively simple mathematical principles will bring the desired solution. There is an old saying among tool designers that "if it can be laid out, it can be calculated by trigonometry." That is close to the truth.

With the idea of helping men in the drawing-room and shop to solve their everyday problems, MACHINERY is starting with this number a "Problem Clinic" that will monthly present mathematical problems in shop work and tool design, and their solutions. These problems, submitted by the readers of MACHINERY, have actually come up in industry. They should provide a background of sound methods for solving similar practical problems as they arise.

Mathematics has been referred to as the "Queen of the Sciences," but it is fully as applicable in solving practical problems at the level of the drawing-room and the shop.

Charles O. Herb



### **What's Ahead in Steel Service**

Many new products and service facilities have been added at Ryerson during the past few months. Many more are in prospect for '56. Here's a review and a look ahead:

NEW STEELS—Three new Ryerson leaded alloys—Rycut 20, Rycut 40 and Rycut 50, were introduced during the past year. Additional sizes of these amazingly fast-cutting alloys have recently been added to our stocks—further additions are in store. Leaded plates, available only at Ryerson, have just been introduced and these New E-Z-Cut plates soon will be on hand in larger tonnages. Other recent additions to Ryerson stocks: Stainless plates and sheets in extra large sizes, welded pump-cylinder tubing, mansard pattern siding in stainless, galvanized and carbon steel, 8615 alloy steel plates for case hardening applications.

NEW SERVICE FACILITIES — Ryerson service facilities are never completed — modernization and expansion go on continuously. A few 1955-56 examples: a brand new Connecticut plant, additional facilities dou-

bling stock and service capacity at Boston, a 30% increase in facilities at Buffalo, new cut-to-length lines at New York and Boston, greatly augmented shearing equipment at Chicago, more plant area at Los Angeles, Detroit and Spokane.

NEW QUALITY PROTECTION—Now, in 1956, still more stringent quality controls are going into effect—giving you added assurance of predictable steel performance every time. And these new controls supplement an existing program of quality checks and counter checks already considered exceptional throughout the metal-working industry.

STEPPED-UP DELIVERIES—Even under the pressure of current demand, a high per cent of all regular orders for steel from stock are shipped within 24 hours—practically all within 48 hours. With expanded facilities we confidently expect to do even better in 1956!

You have helped to make 1955 another year of great progress for Ryerson. We believe we can best show our appreciation by continuing to improve our ability to serve you in the year ahead.

## RYERSON STEEL

In stock: Bars, structurals, plates, sheets & strip, tubing, alloys, stainless, reinforcing, machinery & tools, etc.

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146-MACHINERY, February, 1956

For more information fill in page number on Inquiry Card, on page 245



## Diversified Machining Methods Shape Jet-Engine Blades

Latest equipment and production techniques are utilized in the manufacture of both turbine and compressor blades for modern jet engines. No single machining procedure can be applied equally well to all of the many blade types encountered

By RAYMOND H. SPIOTTA
Assistant Editor

ANY hundreds of precision-machined blades are required to form the compressor and turbine units of today's high-thrust jet engines. Blades for these powerful engines are being produced in large quantities by Utica Drop Forge & Tool Corporation. The company's plant at Clayville, N. Y., furnished with modern specialized equipment, is devoted exclusively to this operation.

Blanks for turbine rotor blades, for use in jet engines, are formed by drop-forging hammers at the Whitestown and Yorkville, N. Y., plants of the company. These blades are forged from both stainless steel and a variety of high-temperature alloys.

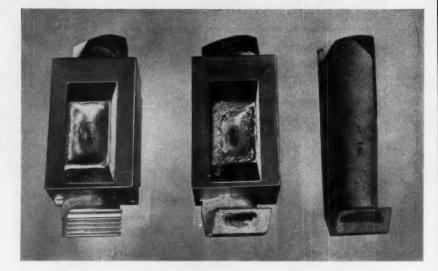


Fig. 1. Turbine rotor blade, as forged (right), after being cast in matrix fixture (center), and after grinding firtree serrations (left).

Being forged as close to finished dimensions as practical, each blank must be positioned to assure minimum amount of metal removal over the entire blade area. After positioning, provision must be made to retain the blank in this attitude until appropriate locating surfaces have been machined. Both of these machining prerequisites are fulfilled by the use of a Jones & Lamson optical comparator equipped with a metal casting device, such as the one shown in the heading illustration.

The dovetailed end of the blank is inserted between two chuck jaws that clamp it in place. Four carbide-tipped tracing styluses, two on the convex and two on the concave side of the airfoil form, are moved laterally across the blade. Rise and fall of the tracers results in corresponding movements of two transparent plates on which the accurate airfoil outlines have been engraved. The two plates, which may be seen below the viewing screen in the illustration, are independently mounted, one having the outline of the blade's convex surface and the other having the outline of the concave surface. These master outlines are projected on the large viewing screen of the comparator.

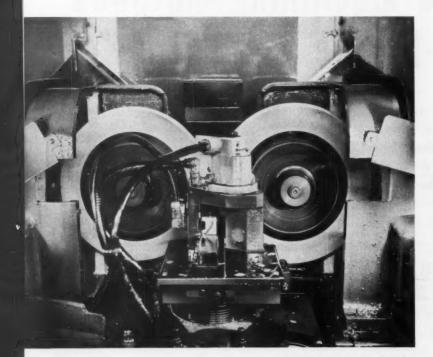


Fig. 2. Fir-tree serrations are being formed on the dovetailed blade end on a vertical form grinding machine. Cast block, containing the blade, serves as a locating fixture.

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While the tracing styluses are moved back and forth across both surfaces of the blade, the chuck mount is adjusted. At this point, the blank is positioned along an imaginary center line so that an equal thickness of metal is allowed on both the upper and lower surfaces for machining purposes.

A steel mold block is slid over the blade and locked. Molten matrix material, having a low melting point, is then poured into the sprue from the spout shown projecting toward the operator from the right-hand side of the machine. After removal from the mold, the longitudinal position of the blade is checked in a gaging fixture by means of dial indicators. The blade as forged, and again after casting, can be seen at the right and center, respectively, in Fig. 1.

Serrations at the dovetailed end of the blade are ground on a Jones & Lamson vertical form grinder, Fig. 2. Machine guards and safety shields have been removed from the machine to illustrate the operation more clearly. The cast block is hydraulically clamped on a vertical machine slide. This slide reciprocates the blade end between two formed wheels.

Two diamond dressers, operating independently of each other, are actuated after completion of each part. With both grinding wheels operating at a reduced speed, the dressers, one for each wheel, feed across the formed surfaces taking a truing cut.

Still utilizing the block fixture, the finishground serrations are checked for size, location, and taper on a Jones & Lamson optical comparator. Longitudinal taper of the serrations is held to a tolerance of plus or minus 0.0005-inch. Following this inspection, the matrix block is broken away on a pneumatically operated guillotine type press.

The back face of the dovetail is ground on a Blanchard rotary surface grinding machine having twin vertical heads. After this operation is completed, the trailing edge of the butt is ground on a Hydrabrasive surface grinder. Two blades are accommodated simultaneously in a grinding fixture which, in turn, is held on an electromagnetic chuck. Immediately after the trailing edge of the butt is finished, a code number, denoting the alloy heat from which the blade was forged, is marked on the ground surface.

Leading edges of both the airfoil and the butt are rough-ground on another Blanchard rotary surface grinding machine having a single vertical head. The blades are held in individual fixtures bolted to the rotary table of the machine. Following this rough-grinding, the blades are transferred to a Norton surface grinder. Here they are clamped, two at a time, in a dual fixture while the leading edge of the butt is finishground.

After the leading and trailing edges of the airfoil have been finish-ground and inspected, the accurate shaping of the airfoil contour is accomplished. Banks of Pratt & Whitney automatic profile grinding machines, Fig. 3, are used for finish-forming the blade. The blade is gripped

Fig. 3. Airfoil form ground on a blade (lower left), with a moving abrasive-coated belt. Three cams, including a master cam (lower right), control automatic operation.





Fig. 4. Surface flaws are detected under an ultraviolet light during application of the Zyglo fluorescent-penetrant inspection method.

on the serrations in a small adapter, as shown in the lower left-hand quadrant of the illustrated machine.

A pivoting work-frame, suspended from a carriage at the upper portion of the airfoil grinding machine, carries three cams. The master cam is at the lower right-hand quadrant. This cam and the work-piece rotate simultaneously, with the master cam causing the work-frame to pivot in and out. As a result of this motion, the master cam shape is duplicated on the semifinished blade as it rotates in contact with a moving belt.

A contact wheel and fixture, supporting the abrasive belt, are located directly behind the work-piece. A wave cam (upper right) transmits a swiveling motion to the fixture supporting the abrasive belt. Rotary speed of the work is automatically varied by means of a velocity cam (upper left). The purpose of this cam is to permit the comparatively thin leading and trailing edges of the blade to pass by the abrasive belt at a faster rate of speed than the broader convex and concave surfaces. As the blade is rotated, it also travels lengthwise across the surface of the abrasive belt.

Three stations along the length of the airfoil section are checked for conformity to the re-



Fig. 5. Any variations in blade configuration are detected during final inspection on this eighteen-column pneumatic gage. This permits eighteen points on blade to be checked simultaneously.

150-MACHINERY, February, 1956

quired contour on a guillotine type gage. Chordal width is checked with a pin gage. Trailing edge thickness is also checked at this time at two places, a station at the tip end and a station at the base end of the blade.

The tips of these turbine rotor blades are trimmed on a Campbell abrasive cut-off machine. Additional metal is allowed on the over-all length. When a radius is ground on the tip, this material will be removed. From the abrasive cut-off machine, the blades are brought to an Industrial washing machine where they are cleaned.

To form the radius on the tip end, the blade is locked in a pivoting fixture on the table of a Bura-way grinder. As the blade is fed toward the wheel, the fixture is swung from side to side, forming the desired tip radius and, at the same time, bringing the blade to the correct length.

A series of manual grinding and buffing operations follow. The root fillet on the concave side of the blade is ground and blended with the airfoil form. The convex root fillet is then ground. A surface finish of 32 micro-inches r.m.s. is obtained by this method. All fillets are blended into their adjacent surfaces. Tumbling operations are employed to impart a smooth, even finish to the blade surfaces.

Surface flaws in the blade that cannot be detected by the naked eye. are brought to light by applying the Zyglo fluorescent-penetrant inspection method. The blades are placed in a wire tray and dipped in a tank containing a special oil. A draining period is allowed, after which the parts

are carefully transferred to an absolutely clean wire-mesh rack.

While in the clean rack, the blades are lowered into a tank containing an emulsifier, then raised and allowed to drain for one or two minutes. Any excess emulsifier is blown off with an air hose before the work surface is checked for discontinuities under an ultraviolet light. After inspection, which may be seen in Fig. 4, the blades are washed under a hot-water spray.

Final contour and thickness checks of the airfoil section of the blade are made on a Sheffield "Precisionaire" gage, seen in Fig. 5. The blade is checked at eighteen points simultaneously, three gaging jets being positioned at each of three stations along the length of the blade, on both the convex and concave surfaces. This blanketing of the airfoil area enables the inspector to ascertain at a glance any variations in blade configuration. Any deviation from the true airfoil contour or position, in relation to the locating serrations on the dovetail, will present itself in a noticeable pattern assumed by the eighteen indicating floats in the gage.

Not all of the diverse blade types required in the construction of jet engines are machined in exactly the same manner. An example of this type of compressor rotor blade is used in one particular model engine.

Broaching replaces grinding as the forming method employed for the fir-tree serrations at the blade base. A three-stage set-up, having the same number of work-holding fixtures, is used

Fig. 6. Fir-tree serrations on blade ends are formed on vertical broaching machines. With a multiple-fixture setup, three individual broaching operations are performed on one machine.





Fig. 7. Root fillets are formed on hand milling machines that have been converted for automatic operation. A cam and follower arrangement alters the work-table height.

flat and also on the airfoil form. The descending broach rough-forms a channel along the length of the back face and finish-forms the fir-tree serrations.

A grinding operation is performed between the second and third broaching stages. In this operation the channel along the back face is finished to size. Both the leading and trailing edges of the butt are finish-ground, maintaining a surface finish of 16 micro-inches r.m.s.

The blades are then returned to the broaching machine, where they are clamped in the third fixture. At this third and last broaching stage, a transverse cut is taken across the fir-tree serrations.

Convex and concave root fillets on the compressor rotor blades are machined. A Nichols hand milling machine, Fig. 7, is set up to handle this operation automatically. The machine is rigged with Bellows pneumatic cylinders to provide positive control over the operation. This same general set-up is used on two identical machines, one being set up for the convex root fillet and the other for the concave root fillet. Four small air jets are fastened to the fixtures to keep them free from chips.

Both the leading and the trailing airfoil edges of these blades are milled to the correct width. This operation, which is done on a Morey profiling machine, may be seen in Fig. 8. Two workholding fixtures are mounted on the machine table, one beneath each of the two spindles.

on the Cincinnati vertical broaching machine shown in Fig. 6. Being the initial operation on the forged stainless-steel blade, no machined banking surfaces are available. Therefore, the first fixture locates the blade from a small protrusion that is forged integrally with the blade. After the blade is clamped in place hydraulically, the broach descends, cutting a locating flat on the dovetail.

Upon release, the blade is transferred to the second fixture on the broaching machine. This time the work-piece is located on the machined

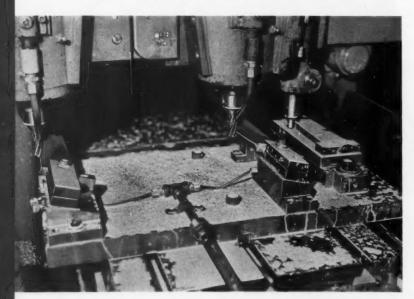
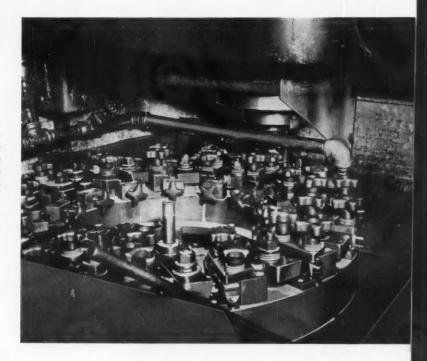


Fig. 8. Profile milling the leading and trailing edges of two blades to size is done simultaneously. The follower traces a path around a master form at the right.

Fig. 9. Butt ends, or platform surfaces, of one type blade are rough cut to shape on this rotary milling machine. The table supports fifteen individual fixtures.



A third spindle contains a stylus. Under this stylus, on the work-table, is the master form of the blade outline. The work-pieces are held in special fixtures. As the profiling machine is operated, the stylus is fed in contact with the master form, thereby duplicating it on the two work-pieces.

Platform surfaces (butt ends) of two similar blade types are machined in two steps: milling followed by grinding. Two Davis & Thompson rotary milling machines, one for each of the two similar blades, are set up for the first step. One of the machines, Fig. 9, has fifteen individual work-holding fixtures bolted to the rotary table.

A gang of side-milling cutters is mounted on the machine arbor. They rough-cut three deep slots and the tops of two lugs in a single pass. Operation of the machine continues uninterruptedly, the fixtures being loaded and unloaded while the table is in motion.

From the rotary milling machines, both similar blades are transported to a Cincinnati grinding machine, Fig. 10. This grinder has a vertically mounted dressed wheel situated at an angle

Fig. 10. Following milling (Fig. 9), the platform surfaces are finish-ground. The blades are clamped, twentyfour at a time, on a vertical rotary fixture.



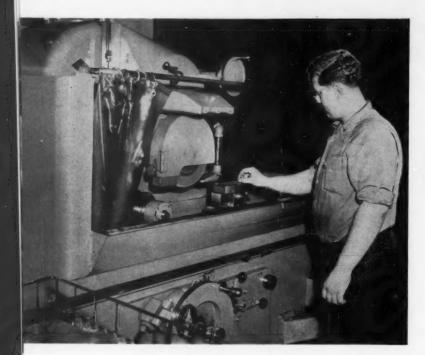


Fig. 11. Surface grinding the concave face of a turbine stator blade. A master form is mounted on the left-hand end of machine table.

to a large, vertical rotary fixture. The fixture accommodates twenty-four blades, twelve of each style. The blades are locked on the fixture in an alternate manner: first one type blade, then the other, and so on around the fixture. Platform and shelf surfaces are finish-ground in this operation by the formed wheel. A dressing unit is built into the upper part of the machine.

Surface grinding is employed in the forming of the airfoil surfaces on one style of turbine stator blade. A Thompson surface grinder, seen in Fig. 11, is set up to form the concave surface on this type blade.

Other turbine stator blades are shaped by a different method. Rymann belt grinders are used to form the blade surfaces. Since only one surface is handled in a single set-up, a second machine is used to shape the opposite side. Above the blades is a cam, formed to the desired contour, over which passes an abrasive belt. With the formed cam backing up the belt and continually forcing it into contact with the rough blade surface, the required material is quickly re-

moved, bringing the blade surface to the correct contour within required tolerances.

Another machine used to form airfoil surfaces of large turbine rotor blades is a Hammond automatic blade polisher. Abrasive belts, which serve as the cutting media, finish the blade to size and then polish it in a continuous operation. Seven work-holding spindles project from a central rotating hub, giving the appearance of a starfish. Each of the spindles has a set of pneumatically operated jaws that grip on the locating surface of the blade. Also contained in each spindle housing are identical sets of cams. As the spindles reciprocate, these cams impart a twisting motion of sufficient magnitude to generate the required blade form.

The blades are reciprocated between two contour pads in each of seven fixed cutting heads that ring the work-holding spindles. Over each pair of these pads passes an abrasive belt. Between each stroke of the blade the abrasive paper strip is automatically advanced to expose a clean cutting surface.

## Why Anti-Friction Bearings Fail

By JOHNNY RIDDLE Tulsa, Okla.

IKE all rotating machine parts which are subjected to cyclic stressing, ball and roller bearings have a definite life span. The actual life curve may, and often does, vary from that established by theory, but it is nevertheless possible to predict the dependable period of performance for a large group of bearings operating under known and controlled conditions. There are frequently disruptions in the anticipated life curve, however, and these may be referred to as unnecessary and avoidable bearing troubles.

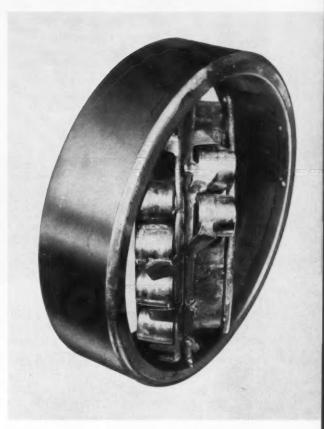
Even a partial understanding of factors contributing to early failure is helpful to both the machine designer and the bearing user. Mechanical devices of quality design and manufacture do not suddenly collapse without cause, and it becomes a point of interest for everyone to examine the matter when trouble occurs. In this article, photographic evidence of premature failures has been assembled, and corrective measures are suggested.

With fatigue failure excluded, the causes of bearing failure in operation may be broadly grouped as follows:

- Malformation of the bearing seat on shafts or in housings;
- Misalignment—cocked, off-square, or tilted;
- 3. Faulty fitting;
- 4. Wrong fits:
- 5. Inadequate or unsuitable lubrication;
- 6. Defective sealing:
- 7. Vibration without rotation;
- Passage of electric current through the bearing;
- 9. Overloads—temporary or prolonged;
- 10. Improper handling;
- Defects in the material used and errors in production.

#### Ideal Conditions for Bearing Operation

Because of the extreme diversity of machine operations, it is evident that no panacea exists. The ideal bearing mounting would be one in which the unit is safely loaded, adequately lubri-



cated with a quality grease or oil, effectively sealed against extraneous properties, and otherwise fully protected. This would involve absolute accuracy in mounting and installation, and would further require that every phase of handling and maintenance be attended with the utmost care.

Nevertheless, near-ideal mountings do exist, and from them it is known that care in design and mounting extends bearing service life. If the ball track is located in bottom dead center, it proves that accurate alignment and balanced loading conditions existed when the bearing was in operation.

If the outer ring shows a ball path which moves from shoulder to shoulder, tilted mounting may be the cause. For example, Fig. 1 shows a ball path moving from shoulder to shoulder, all within a space of about one-third of the ring circumference. In another instance, the ball path was found to be 1/8-inch off-center in a 3-inch diameter raceway. The ring itself was tilted only

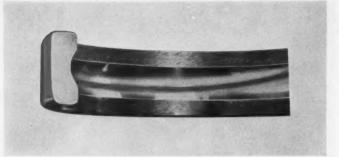


Fig. 1. (Left) Misalignment of ball bearing may cause ball path to move from side to side as in this outer ring.

Fig. 2. (Right) Small area at left of center on this inner race of a single-row, radial bearing shows the beginning of fatigue failure.



about 1/64 inch, but produced a greater change in the ball path because of the change in contact angle. The inner race had a very wide ball path caused by cross-movement of the balls. In this bearing, only the retainer showed deterioration. Neither race failed, except for a slight roughening from the metallic particles which came off the separator. The retainer cracked and then broke. In fact, a great many separator failures in standard single-row ball bearings can be traced back to an off-square condition of either the inner or outer race. Oftentimes, however, resinous lubricants contribute to failure by setting up a high-frequency vibratory condition which in time fatigues the cage material.

Ball speed variation, caused by off-square operation, produces the greatest effect when the balls are never free to readjust themselves, as in a tight bearing or in a unit carrying mainly thrust loads. The variation in ball speed is then accumulative, and the side-acting balls force the retainer until it strikes the inner or outer race. Outer race tilting can be easily determined in operation, since it is evidenced by an eccentrically operating cage. With inner ring tilting, the eccentric retainer rotates at the same time as the inner ring.

Broadly, there are four types of bearing misalignment:

- Out-of-line conditions, which rarely cause trouble;
- Tilting, or off-square, which is far more common;
- Inner ring tilting caused by the shaft shoulder;
- 4. Shaft deflection.

It is a point worth remembering that on a 1-inch diameter shaft, a 0.005-inch off-square shoulder corresponds to a 1/4-degree angular misalignment.

#### Normal Fatigue Failures in Bearings

Considering the tremendous stresses under which a bearing operates, and from the knowledge that cyclic stresses eventually produce certain reactions, it is known that fatigue will ultimately overtake the bearing. Depending upon the prevailing factors, fatigue failure may occur after a few hours, days, weeks, months, or years. Molecular fatigue, crystallization, spalling, and other similar terms are often used in discussions of fatigue failure. Moreover, they are, as defining terms, rather loosely applied. In this article, only the term fatigue will be used.

Fatigue normally begins as a small, well-defined area, as seen in Fig. 2. This illustration shows an extremely wide ball path marking, and

may be indicative of a severe and prolonged overload. In the case of the cup, seen in Fig. 3, for a tapered roller bearing assembly, the appearance of a flaked area is also visible. If such bearings are allowed to remain in service, the initial spalled or flaked areas will spread rapidly and will ultimately cover most of the load-carrying areas.

It should be remembered that ball and roller bearing loads are supported on extremely small contact areas. Ultimate reactions from cyclic stressing are commonly known, and it is not within the scope of this article to discuss them. In fact, many bearing users are satisfied if a long period of smooth performance precedes the initial appearance of fatigue.

#### Effect of Heating on Bearing Operation

Overheating may be ascribed to one or more of the following conditions:

- 1. Failure of lubricant;
- 2. Collapse of lubricating system;
- Cramped bearings, either inherently or as a result of clamping;
- 4. Off-square, producing heat at the retainer;
- 5. Heat from an external source.

The final effect of extreme heat on highquality steel balls is seen in Fig. 4, where only distorted blobs of metal remain. These were originally accurate chromium-steel spheres, manufactured under careful control and thoughtfully selected for use in a ball bearing.

Balls may be particularly susceptible, since the generated heat cannot be conducted away from them as rapidly as from the ring members of the bearings. Abundant lubrication may make possible continued operation, but it will not indefinitely protect a bearing subjected to abnormal heating. Powerful centrifugal forces are acting on the rapidly rotating balls, and, under an extreme temperature rise, the balls may actually melt and flow. Temperatures of this degree are not at all uncommon, though they are in practically every case due to irregular conditions. It is not infrequent that the balls will melt and flow around the shaft and inner ring.

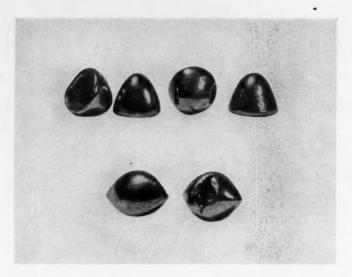
The remains of the spherical roller bearing seen in the heading illustration show the complete destruction possible through overheating. Discoloration is a sure symptom of excessive heat, and the metal is sometimes discolored even beyond a gun-metal blue. In the bearing shown, seizure and scoring occurred when the unit locked against rotation. Heavy strips of the bronze retainer were torn away and smeared throughout the roller paths. This roller bearing was selected with an initial internal fit entirely too tight for the service involved, and no amount of lubricant, even under forced flow, would have prevented the failure. However, such measures might possibly have postponed the final effects. The bearing user is indeed fortunate if severe mounting and machine damage does not attend such a complete and needless failure.

Similar effects are produced by extreme heat on conventional single-row, radial bearings. In one instance, an off-square condition caused heat at the ball-retainer points of contact, which in turn caused early deterioration of the lubricant.

Fig. 3. Flaked area on this cup from a tapered roller bearing assembly would spread rapidly if the bearing were kept in service.



Fig. 4. Examples of effect of extreme heat on high-quality steel balls taken from a bearing. These blobs were exceptionally accurate chromiumsteel balls.



As a result, scoring and smearing accelerated, and the assembly failed, with measurable wear in the cage pockets.

One or more factors may contribute to overheating. A heat failure is frequently analyzed as lubricant failure, while in reality the lubricant is entirely adequate for the service involved. Rapidly generated heat, if it constantly exceeds the ability of the mounting to conduct it away from the bearing area, will break down the lubricant.

#### Dirt is a Major Cause of Trouble

As a single source of trouble, dirt probably exceeds all other causes. Nothing more quickly destroys the precision qualities of bearings. When dirt enters, the bearing soon becomes rough, noisy, and entirely unserviceable. A condition which is not at all uncommon, is a new

bearing becoming covered with grit and dirt particles even before it is installed. Nearly all dirt, even shop dust, is abrasive in nature, and will start a cutting action when it enters the bearing.

The immediate results can be observed closely by examining Fig. 5. Here, two radial ball bearings have been disassembled after a short period of service. In the one at the right, the original gloss and smooth surface finish have been retained, while in the other a dull gray color has developed. Wear has already begun in the bearing at the left, due to the presence of extraneous substances. Under continued service, the wear would develop gradually, and eventually a looseness of 1/32 inch or more would develop. With such conditions, the balls are gradually worn undersize, the grooves are enlarged, and the unit completely loses its centering accuracy.

The results of foreign matter are again shown

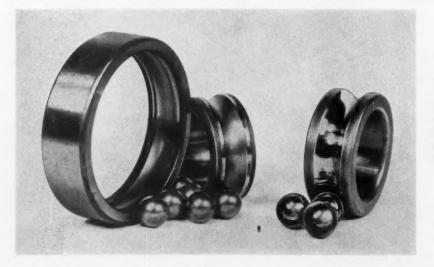


Fig. 5. Comparison of two radial ball bearings disassembled after short period of service shows the dulling effect of dirt on bearing seen at the left.

Fig. 6. A foreign substance was hard enough to penetrate the groove of this bearing ring when it became trapped under the balls.



in Fig. 6. While relatively soft dirt will cause a fine lapping action, a harder substance produces the condition illustrated. In this instance, the particles were hard enough to penetrate the groove surfaces when they became wedged and rolled under the balls. In any case, the lapping action becomes a self-feeding condition, as more and more metal is lapped away to become an abrasive agent itself. It is not at all uncommon to find a radial bearing worn as much as 1/16 inch or more.

The effects of metallic substances are seen in Fig. 7, where the straight rollers in the bearing show heavy damage. This unit was installed in equipment for processing aluminum alloy, and a defective sealing arrangement contributed to early entry of metallic particles. A new bearing, shown at the right, provides a sharp contrast.

#### Effect of Negligence and "Brinelling"

Damage incurred by negligent handling is unmistakable. It may involve damage to the bearing cage, or to other components such as shield

members or rings. This type failure, or damage resulting in early failure, is entirely under the control of the bearing user. The only corrective measure lies in improved handling. One frequently finds seal or shield members bent or distorted, and such damage is bound to lead either to lubricant loss, entry of dirt, or both.

The results of "Brinelling," or pressing of the balls or rollers into the ring grooves, are seen in Fig. 8, where three distinct ball impressions appear on the bearing inner ring. Damage of this nature is normally due to off-square blows against a ring member, during installation, with a hammer or other heavy mounting tool. At the impact of such a blow, three or so balls sustain the entire force, and sometimes this is great enough to permanently deform the member as shown. Such damage is permanent.

A form of false Brinelling, often mistaken for the real thing, is shown in Fig. 9. This condition may occur when bearings do not rotate for long periods. Although the loads on the bearings may be relatively light, slight depressions in the surfaces of the raceways may result from even

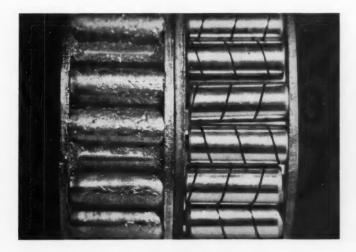
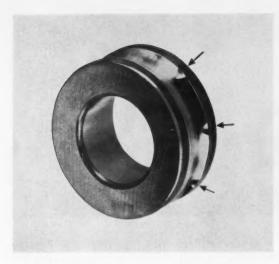


Fig. 7. Heavy damage has been done to the rollers in the bearing at the left by a metallic substance allowed to enter the bearing due to defective sealing.



minute axial or rotational movements. These depressions appear as wear symptoms under each ball or roller as the case may be. The shape of the contact ellipse is indicated, although it has been lengthened and broadened by the small axial movement of the balls. False Brinelling of this nature is a wear phenomenon often referred to by the terms "friction oxidation" or "fretting corrosion."

The lubricant plays an important role and should be carefully analyzed when failures of this nature develop. Moreover, it is well to note that such wear progresses rapidly in the presence of foreign matter. Also, iron pick-up may accelerate the rate of wear.

#### Faulty Lubricants Cause Sludge

A faulty lubricant may be described simply as an oil or grease that does not meet the requirements of a bearing lubricant. It may contain additives and general impurities, or it may be a good lubricant basically which has become

Fig. 8. Three ball impressions (indicated by arrows) on this bearing inner ring are the result of an off-square blow by a hammer during installation.

contaminated through careless handling. Lubricants of inherently poor manufacture must also be included.

The manner in which a grease may oxidize to form resinous, gummy sludge, is illustrated in Fig. 10. Such formations are harmful to bearing service, and often will contribute to failure of the retainer. The oil separates from the soap, leaving only the black residue which may or may not show traces of iron pick-up.

Corrosion often appears as a reddish-brown coating, adjacent to but not in the ball track. Small etched holes may also be found along the exposed surfaces. Etching may not show along the ball track, since the loaded balls push the lubricant and the corrosives from the track. However, corrosive oxides may act as a lapping agent, causing wear and producing a dull, gray color on the balls and in the ball grooves. The inner ring of a double-row ball bearing, after a period of corrosive action, is shown in Fig. 11.

A grease need not show water-absorbent qualities to qualify as a good grease. Some greases are not supposed to withstand wet conditions, while others show strong tendencies to do so. The user should acquaint himself with various soap structures and their recommended uses if extremely moist or wet conditions prevail.

The consistency or density of the lubricant is also critically important. One will occasionally find evidence of smearing on cylindrical roller bearing rings and rollers. The causes may be of a multiple nature, such as sudden acceleration combined with the use of a lubricant too solid in consistency, or they may be traced to a lubricant relatively solid but present in excessive

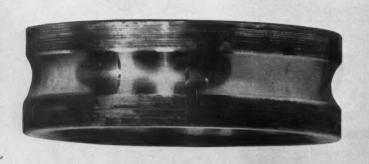
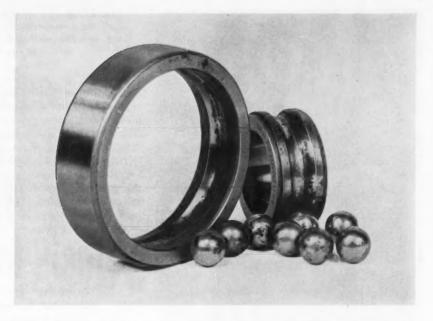


Fig. 9. Depressions such as the ones seen in ball groove of this inner ring may result from minute axial or rotational movement of bearing.

Fig. 10. A resinous sludge on balls and bearing rings, resulting from oxidation of grease, may contribute to failure of the ball retainer.



amounts. An initial tendency to smear may disappear completely after the machine passes the run-in period, and the grease attains good working consistency. Nevertheless, the bearing remains damaged.

While a relatively slight ring creep may be desirable in many bearing mountings, such controlled motion is not to be confused with rapid spinning. Outer ring markings indicating comparatively fast motion between the outer ring and housing seat are illustrated in Fig. 12. The bearing ring is normally of harder and tougher material, but the gradual metal pick-up will quickly abrade both members.

The tendency of a bearing to spin rapidly on its seat is the result of a faulty fit or other improper installation procedure, and should be corrected immediately. If rapid spinning continues, the ring may cut into the housing or through the shaft, as the case may be.

### Ball Track Patterns Give Evidence of Dislocation

Another condition which may result in early failure is illustrated in Fig. 13. In this instance, one ball track was formed during the initial runin period of the bearing. Then something occurred which dislocated the bearing, and a second ball track was the result. Such dislocation might result from the collapse of a supplemental locating ring, or from the breakdown of a metallic burr which originally prevented the bearing from seating properly. At any rate, the rings or at least one of them did move, and the second track was formed. Should they converge,

Fig. 11. Dull gray color of this inner ring from a double-row ball bearing is the result of a lapping action caused by corrosive oxides.





Fig. 12. Marks on this bearing outer ring indicate comparatively fast relative motion between the ring and the housing seat in which it was mounted.

and improper hardening. Rigid standards of control have pushed these troubles far into the background, however, and it is indeed seldom that the failure stems from faulty materials and manufacturing methods. An impartial inspection is almost certain to show that the trouble began with the bearing user. After recognizing the cause of trouble, the problem is normally solved at that point. Modern ball and roller bearings are designed to give many years of troublefree service if properly handled, installed, and maintained.

Scientists Honored by the

## **American Society for Metals**

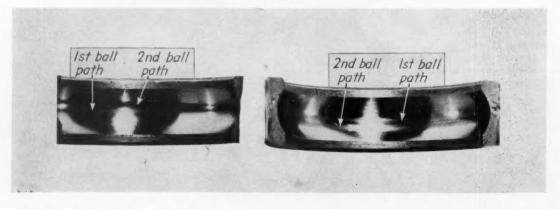
Three scientists of the Crucible Steel Company of America were recently presented two of the highest awards conferred by the American Society for Metals. Peter Payson, assistant director of research and development, was named Campbell Memorial Lecturer for 1958 on the basis of his outstanding ability and many contributions to the metallurgical field. A. E. Nehrenberg, supervisor of tool and die steel and structural steels research, and Peter Lillys, research metallurgist, were awarded the Howe Medal at the Society's recent meeting in Philadelphia for their paper "High Temperature Transformations in Ferritic Stainless Steels Containing 17 to 25 Per Cent Chromium." The Medal is given annually to the author or authors of the paper of highest merit to appear in the Society's publication "Transactions."

as they often will if cocked or off-square conditions are present, the point at which they cross may become an area of fatigue.

This condition may also explain the frequent sudden failure of bearings when they have been returned to service after thorough inspection and cleaning. With the bearing rings located in new positions due to remounting, the balls may not return to their original tracks, and new ones are formed. This may lead to early failure.

Other causes of bearing failures that are generally less frequent include crater and "washboard" formations resulting from the passage of electric current through the bearing, grinding checks, cracks due to metallurgical defects,

Fig. 13. First ball path was formed during initial run-in period of bearing. Then, due to dislocation of bearing, a second ball track was formed.



## What An American Engineer Saw In Soviet Industrial Plants

As told to Charles O. Herb Editor of MACHINERY



Nevin L. Bean—one of three industrial experts who recently visited manufacturing plants in the Soviet Union

URING the latter part of November, 1955, three American industrial representatives were invited to visit manufacturing plants in Soviet Russia. The invitation resulted from a reciprocal agreement between the U.S. State Department and the Soviet Government which permitted three Russian industrial experts to attend the Machine Tool Show held in Chicago last September.

The three-man delegation chosen for the trip included Dr. Albert C. Hall, research manager of the Bendix Corporation, Dr. Welden H. Brandt, an engineering manager of the Westinghouse Electric Corporation, and Nevin L. Bean, technical assistant to the general manager of Ford Motor Co.'s Automatic Transmission Division. In an interview for Machinery, Mr. Bean presented his first-hand observations of manufacturing in the Soviet Union.

"We arrived in Leningrad on December 7 and departed from the same city for the United States on December 22. During the intervening two weeks we visited several manufacturing plants as well as research and development centers. There also was a final round-up conference with Russian engineers and officials."

He pointed out that the group was royally entertained wherever they went, that they were given the opportunity of taking as many photographs as they wanted in industrial plants—and almost everywhere else—and they heard many expressions of friendship for the American people from the engineers they met. Toasts at the numerous dinners and banquets tendered the delegation expressed a desire for wider exchange of technical knowledge, as well as for continued peace and a better understanding between the peoples of the two nations. Generally, questions concerning manufacturing processes were answered in a forthright manner.

"Two weeks behind the Iron Curtain does not qualify a person to speak authoritatively on the over-all efficiency of Russian industry. However, one does obtain definite impressions. We undoubtedly were shown the most modern plants and manufacturing processes. What we did see, however, was impressive."

#### Machine Tool Plants Visited

"Our first tour was in the Ordzhonikidze Machine Plant, where we were taken through all manufacturing and assembly departments. This particular plant specializes in the building of cam-follower machines; 6- and 8-inch horizontal boring mills, reminiscent of Giddings & Lewis machines, with an elevating platform type head,

an upright column about 16 feet high, and a table 26 feet long; planers of various types, similar in design to Gray planers; automatics, similar to Cone; and special transfer machines."

This plant, the group was told, was constructed during the first five-year plan of Stalin's program and began operation in 1932, equipped mostly with foreign machine tools. The group saw Gardner grinders, Cincinnati milling machines, King boring mills, and many other machines of American manufacture, some of which were of fairly new vintage. It was explained that the newer machines were in the plant as a result of an exchange agreement and not because of a lack of local supply. The director of the plant was quite explicit in telling the group that the Soviet Union is now in a position to supply any type of machine tool required.

"Castings used in the construction of machine tools seemed to be of excellent quality, and the usage of ceramic tools was noticed on two turning operations," Mr. Bean said. "In this plant there were about 3500 employes, of whom 2600 were on productive labor. Approximately 450 were engineers. The director of the plant told us that he was of peasant parentage, and had held various positions as designer, engineer, technical director, and chief engineer in his progress to the directorship. The director claimed that workers are rewarded for individual efforts and suggestions, and that frequently the royalties from suggestions and patents exceed the salaries normally paid for job classifications. In general, the departments were not as clean as in comparable American shops, but the workers appeared diligent. Between 40 and 50 per cent of all workers were women.

"On another day we visited the Moscow Krasny Proletariat, a plant that manufactures lathes and other machine tools and employs 4000 workers. The plant was well equipped, and the lay-out appeared good except for a certain amount of crowding. The lighting, however, was very poor. The machine produced in greatest quantity is a turret lathe. I noticed that clutch teeth, splines, gears, and nearly all other wearing parts are hardened, mostly by the induction process. Their induction-hardening machine is of a universal design and has a capacity of 200,000 volts.

"One outstanding method in assembling turret lathes consisted of using a floor type walking-beam conveyor which advances each machine one station at a time. It was claimed that the production of the line was over fifty machines per day." The visitors were shown a machine in the experimental laboratory equipped with electronic sizing devices—push-buttons on panels were used to establish diametrical and lateral dimensions.

#### **Activities of Metal Cutting Institute**

"At the Metal Cutting Institute, which is referred to as ENIMS," Mr. Bean related, "there are three main departments-technical, metallurgical, and design. The plant houses about fifty laboratories and technical departments whose responsibility it is to improve and duplicate electric and hydraulic applications. There is one large department of technical information that distributes data about experiments to all operational units in the Soviet Union. New designs of machine tools and equipment are supplied for plants throughout the country. Designs from engineering departments of other plants are either accepted, improved, or rejected. The Institute provides a program to be fulfilled by each Soviet industrial plant under a special five-year plan. It originates the general plans ten to fifteen years ahead, and every five years a special detailed plan is worked out. The Institute also designs automatic transfer lines. It has a technical library of over 200,000 volumes, and engineering information from all over the world is screened.

"The Institute controls the design of all machine tools built in the Soviet Union. While individual machine tool plants maintain large engineering forces, they do not build any machine tools until the design has the approval of the ENIMS personnel. There are about 475 engineers, whose salaries, we were told, range from 1400 to 3000 rubles per month (\$350 to \$750). Many of these engineers receive very substantial monthly bonuses."

#### Electronic Digital Comparator that Makes 7000 to 8000 Calculations per Second

At the Institute of Precision Mechanics and Calculating Technology, the delegation was shown an electronic digital calculator that is said to average between 7000 and 8000 arithmetical processes per second. This computer, they were told, has solved a multitude of problems in diverse branches of scientific knowledge and engineering. For example, in compiling maps from geodesical survey data, a set of algebraic equations with a large number of unknown quantities must be solved. Problems containing 800 equations calling for approximately 250,000,000 arithmetical processes are solved by the electronic computer in less than twenty hours.

The visitors were told that the machine controls memory for 2048 numbers. The machine is about three years old and is operated twenty-four hours a day, six days a week. It has about 5000 electronic tubes. The unit is about 90 feet long, 10 feet high, and 4 feet wide. The scientist who designed this equipment reportedly receives 5000 rubles monthly (\$1250) above his regular salary.

#### Gorky Automobile Plant Produces 1000 Cars and Trucks Daily

"The Gorky automobile plant employs approximately 45,000 people and produces about 120 passenger cars, 100 agricultural cars that resemble 'jeeps,' and 780 trucks per day," Mr. Bean stated. He was told that all trucks were destined for the Soviet State. It was explained that no one in Russia can employ another person when that person would create a profit for the employer. This makes the necessity for privately owned trucks practically nil.

Two models of passenger automobiles are built —Model ZEM, which closely resembles an older model Buick sedan, and a "Victory" model that is smaller than American cars in the lower price range. A new car, known as the Volga, and of a design slightly larger than the "Victory" will soon be placed in production.

"I was not favorably impressed with the layout of all the shops or the production lines," Mr. Bean said. "Some of the manufacturing equipment was old and crowded together, and material-handling facilities were somewhat inadequate. Lighting did not compare favorably with similar factories in the United States, although I noticed that employes seldom wore glasses. Incidentally, the 'Victory' automobile is rated at 52 H.P. and has a four-cylinder engine.

"There were unique manufacturing operations in this plant involved in the production of valve push-rods. Small bars are turned out on an automatic screw machine, and one end of these bars is upset to produce a recessed head. The parts are then fed automatically to a rotary table which carries them under an induction-melting unit. A high-chromium alloy here melted is poured into the recessed head of the valve push-rods to insure a hardness of from 58 to 60 Rockwell C-scale."

#### The State Ball Bearing Factory Has a Remarkable Automation Set-Up

"The largest ball bearing plant in Europe is located in Moscow and here an automated line has been in operation for four months," he related. "Two other lines are under construction. The group was impressed by the completely automatic processing and assembly line, where all operations are performed automatically (including handling between operations) until the packaged bearing is ready for shipping. Hotrolled forgings are dumped into a hopper at the start of the production line. These parts are carried into automatic chucking machines and other machine tools for turning and boring operations, heat-treating processes, grinding operations, inspection, assembly, testing, and packaging. In the packaging stations the bearings are wrapped in oiled paper and sealed in individual cardboard boxes. The only persons along this line are the men who adjust and maintain the equipment.

"The automation applied in this line would be a credit to any engineering organization because the design of the equipment is exceptionally clean. Piping and wiring are completely enclosed,

Automobiles produced today in Russia are reminiscent of American automobiles of fifteen years ago. This photograph was taken in the Gorky plant



as well as the transfer devices between the separate manufacturing units. The heat-treatment is performed in electric furnaces right in the automated line.

"We were surprised at the storage facilities in the automated set-up for holding reserves of parts between operations. These storage units are approximately 7 feet square by 9 feet high and house from 3000 to 4000 parts.

"Their classification of the precision of grades of bearings is quite similar to ours. About 1300 different bearings are made, which range in weight from 150 grams to 4 tons. Approximately 60,000,000 bearings are produced per year. All machine tools installed in the automatic line were built in Moscow shops.

"In departments of this plant where automation has not been applied, many workers operate on a piece-work basis, and in some cases dies and tooling are produced on the same basis. The group was told that in tool-room operations, when parts are damaged and must be scrapped, the worker is obliged to pay for a portion of the loss. It was explained that this practice encourages efficiency.

"On other lines, over 50 per cent of the employes are women. Since this practice presents a problem of looking after children, the plant has established kindergartens, pioneer groups for the older children, and elaborate medical facilities to take care of the workers and their families. There is a beautiful recreation 'palace' that contains gymnasiums, swimming pools, and auditoriums where ballets, operas, and stage plays are given by the workers. The plant is practically a city in itself."

#### Stalingrad Tractor Plant

"The tractor plant at Stalingrad employs about 16,500 people and also provides excellent recreational equipment for employes," said Mr. Bean. "A caterpillar type tractor produced since 1950 is driven by a Diesel engine of 54 H.P. and is equipped with a transmission having five forward speeds and one reverse speed. In the steel foundry of this plant, the metal is melted in electric furnaces. The foundry did not appear to be as clean and orderly as up-to-date foundries in the United States. The pouring and shakeout lines were in good order, and the type of equipment in these lines was similar to that employed in molding processes in the United States. When asked, I conveyed my unfavorable impression of the foundry to the acting director and other personnel.

"Certain sections of the machine shop were equipped with transfer type machines of apparently efficient design. However, a great deal of manufacturing was done on standard machines, of which a considerable number were quite old."

#### An Institute that Studies Hydraulic and Pneumatic Controls for Machine Tools

"The Institute of Telemechanics and Automation in Moscow is devoted to a study of general theoretical problems, the theory of automatic controls, and the theory and general structure of telemechanics. Linear controls and impulse systems are developed, as well as digital systems, relay actions, and new types of measuring machines," Mr. Bean continued. "Some of the subjects currently being explored are: theory of square hysteresis, the use of cold cathodes, the theory of digital control, theory of tracing and servo systems, analysis of quantity or quality according to amplitude, automatic control of linear systems, and experimental control of pneumatic and hydraulic devices."

### Almost 2,000,000 Students in Soviet Colleges

The Moscow State University, the group was told, was founded approximately 200 years ago, and although 85,000 students have graduated since its establishment, 45,000 have graduated during Soviet control. At the present time, there are 23,000 students enrolled. The delegation was told that there are thirty-three universities and nearly 1000 colleges in Russia having an enrollment of about 1,750,000 students. Over 800,000 of these are taking engineering and science courses. The departments, laboratories, halls, and classrooms of the Moscow State University were not only beautiful but appeared to be planned in an unusually practical manner.

"At the beginning of our visit to Russia," Mr. Bean concluded, "we were informed by members of the United States Embassy and by our Soviet interpreter that Russians do not appreciate flattery but prefer statements to be accurate and factual. They seemed pleased when we offered criticisms in good faith without intention to belittle. Their eagerness to improve industrial conditions is matched only by the aggressiveness with which they are attacking problems that are involved in bringing them abreast of manufacturing conditions in other countries. Russian engineers beam and show sincere appreciation when recognition is made of favorable accomplishments, especially when the developments are on a par with operations in the United States. From all appearances, the attitude of Russian engineers indicated that they still look to the United States as the outstanding example of modern industry."

## **Annealing Large Stainless-Steel**

## Weldments

By Horace C. Knerr President, Metlab Co. Philadelphia, Pa.

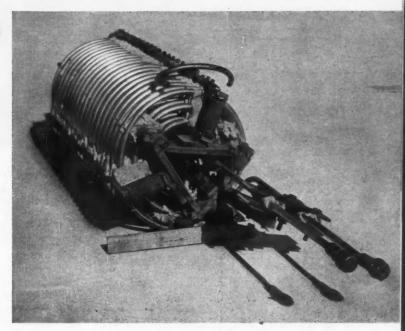


Fig. 1. Asbestos paper is inserted between hot-rolled steel bracing and stainlesssteel heat exchanger coil to prevent diffusion of carbon during annealing.

TAINLESS steels of the austenitic type are easily welded by almost any commercially available means. The many valuable properties of these steels, including their resistance to corrosion and elevated temperatures and their non-magnetic characteristics, have resulted in widely diversified use. For maximum resistance to corrosion, however, it is necessary that these materials be free from residual stresses due to cold working, and from carbide precipitation which may occur during welding of several types when metal temperatures are in the range of 800 to 1600 degrees F.

Certain types of stainless steel have been developed to minimize the degree of carbide precipitation which might occur. Weldments of Types 304L and 316L, which contain less than 0.03 per cent carbon, will withstand many corrosive conditions without final annealing. Also, the stabilized grades of stainless steel, Types 321, 347, and 348, overcome carbide precipitation due to the addition of titanium, columbium, or tantalum. However, under certain severe conditions, these types may still be subject to localized "stress corrosion" due to cold-working effects. In the stabilized grades, this can be prevented by using a stress annealing treatment, which is simpler, less costly, and not as hazardous as the

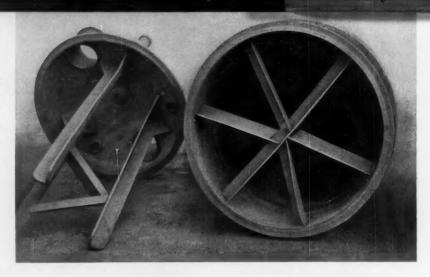
full solution anneal required for other austenitic types of stainless steel.

Full solution annealing to develop maximum resistance to corrosion consists of heating to a temperature between 1950 and 2050 degrees F., saturating, and cooling rapidly. This removes residual cold-working stresses, puts carbides into solution, and prevents precipitation of the carbides during cooling.

In specifying heat-treatment, it is essential to distinguish clearly between full annealing and stress annealing, and to avoid the ambiguous term "normalizing." While full annealing does remove stresses as well as precipitated carbides, stress annealing, done at lower temperatures, will actually cause severe carbide precipitation and greatly lower the corrosion resistance of unstabilized types of stainless steel.

Practical difficulties interfere with the use of artificial, non-scaling atmospheres in the heat-treatment of large weldments such as tanks. It is, therefore, customary to heat in semi-muffle (indirect-fired) furnaces. A neutral to oxidizing atmosphere is preferable because reducing atmospheres tend to produce a much tighter scale which is not easily removed. It is also essential that a sulphur-free fuel be used since most stainless steels are rapidly attacked by sulphur-bear-

Fig. 2. A stainless-steel tank, 4 feet in diameter, is provided with a star-shaped brace near its open end for annealing. Legs on the dome seen at left are braced with angles.



ing gases at high temperature. Parts must be carefully pickled after annealing to remove all traces of scale or oxide.

The selection of quenching method requires judgment and experience. For parts of heavy or solid section, full water quenching is an easy method. However, large weldments such as tanks and coils would be severely deformed by this technique. Thus, spray quenching is used unless the metal is sufficiently thin to cool within three minutes in air. A very light section, having up to about 1/8-inch wall thickness, will ordinarily cool fast enough. Air blowers may be employed to hasten cooling for moderately heavier sections. Spray quenching has many advantages, but it must be used with skill under competent, direct supervision because failure to cool certain areas within the specified time may result in corrosion in service.

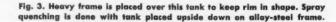
During cooling from the full annealing temperature, no serious carbide precipitation will occur at temperatures down to about 1850 degrees F. It is desirable from a practical standpoint to allow the work to cool to this temperature before beginning to quench. The material

has higher strength at this lower temperature, and there is less danger of deformation. After the first areas of the work have cooled to 1850 degrees F., it should be cooled down to about 900 degrees F. within three minutes, or less. After this, artificial cooling should continue but time is not critical.

The attachment of test coupons to parts is, at best, of limited value, as it is impossible to insure that these coupons and the various areas of the work being treated will cool at the same rate. Of greatest importance are care, skill, and integrity on the part of the heat-treater. Severely unbalanced quenching, in which certain areas are cooled much faster than others, may create residual stresses in the work which will not only contribute to deformation, but also lower the corrosion resistance of stressed areas.

#### Methods of Bracing

At the high temperature required for full annealing, even stainless steels have comparatively low strength. Parts may sag under their own weight while heating and when removing them



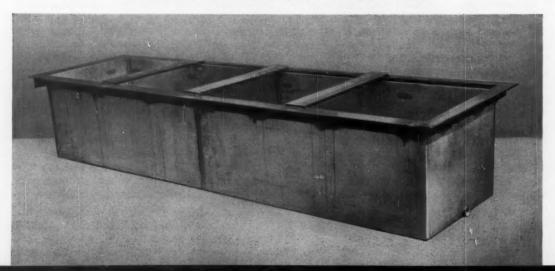
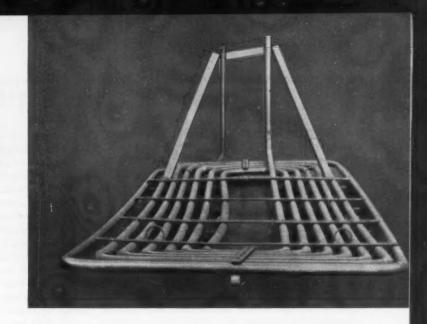


Fig. 4. While relatively little bracing was used on this flat, rectangular coil, distortion was kept within allowable limits by proper handling.



from the furnace for quenching. Weldments of comparatively delicate construction usually require well-designed bracing to support them during these operations. Neglect of this precaution may result in high costs for re-working and straightening after heat-treatment, regardless of the care exercised by the heat-treater.

While ordinary hot-rolled steel may be used for bracing under certain circumstances, the bracing will possess very little strength at full annealing temperatures. In fact, the use of such bracing may even contribute to deformation since the coefficient of thermal expansion of carbon steel and stainless steel differ widely, the latter being much higher. Thus, it is definitely preferable in most instances to employ stainless steel for bracing.

Heat exchanger coils usually require the most extensive support. Each turn should be individually braced, usually at three points on the circumference, by welding or bolting spacers to longitudinal battens. In addition, the longitudinal battens should be joined together by starshaped braces at the top and bottom of the coil. Fig. 1 illustrates a well-braced heat exchanger coil having three concentric sets of turns. In this particular case, hot-rolled steel was used for bracing, but asbestos paper was inserted between the braces and the coil. This was done to prevent the diffusion of carbon from the common steel to the extra low carbon stainless steel, which would readily occur at full annealing temperatures and thus lessen corrosion resistance. Gangmounting of similar parts for mutual support during heat-treatment is sometimes desirable and economical.

Large cylindrical tanks having thin-wall sections require adequate internal bracing, usually in the form of star-shaped braces at suitable points along their length. For closed tanks, ac-

cess should be provided through a manhole for this purpose. Smaller, open-end tanks may require only one star-brace at or near the open end, as shown in Fig. 2. Dished heads on tanks will usually not require special bracing but flat heads may. Such heads can be easily supported by tack-welding stainless-steel angles across them diametrically.

Rectangular tanks are especially subject to deformation, and their sides and bottom invariably buckle somewhat in quenching. However, a cross-braced frame tack-welded across the open top will materially aid in keeping the rim in shape. The tank seen in Fig. 3 is approximately 10 feet long and has a 1/4-inch wall thickness. A heavy frame was placed over the top to keep the rim in shape. The tank was placed upside down on an alloy-steel frame, placed on the furnace hearth, and spray quenched in that position.

### Furnace Loading and Handling of Large Work

The method of setting large parts in a furnace must be given careful attention and depends upon their design and weight distribution, as well as the metallurgical requirements for uniform heating and cooling. Large cooling coils are generally loaded in furnaces with their axes vertical. However, expansion joints are usually loaded with their axes horizontal because out-of-roundness can be easily removed by slight reworking, while any tendency to collapse the corrugations would destroy the usefulness of the part.

Large cylindrical, closed-end tanks require special care. Firebrick saddles can be placed at various points along the length of the tank, thus forming a cradle supporting a substantial segment of its circumference to prevent indentation. The individual bricks are separated to avoid restricting heat flow. For quenching, the tank can be lifted off the furnace hearth by means of chains looped under each end, and the hearth returned into the furnace. A series of fire-spray nozzles, each handled by an individual operator under competent supervision, has been found to be a most suitable method of quenching such tanks uniformly over their entire surface while suspended in air.

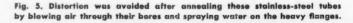
In some cases it may be almost impossible to handle parts directly at high annealing temperatures without encountering some distortion. A good example is the flat, rectangular coil illustrated in Fig. 4. This coil was moderately braced with stainless-steel battens, together with angle braces for the lead-ins. To provide support in the furnace and also as a means of handling during quenching, the coil was placed on a heat-resisting alloy-steel frame. In this way, only the frame was subjected to handling during heat-treatment.

An interesting example of a rather difficult shape that has been successfully heat-treated is illustrated in Fig. 5. These stainless-steel tubes are 10 inches in diameter, 35 feet long, and have a 3/16-inch wall thickness. One end of each tube is necked down to a smaller diameter and has a heavy flange attached. After heating to the annealing temperature, the tubes were drawn out of the furnace onto rollers while a jet of air from a powerful blower was passed through the interior for cooling. At the same time, a spray of water was directed at the heavy flange. This resulted in uniform cooling and almost no distortion of the tubes being heat-treated.

#### Metallurgical Help in Design Assures Good Heat-Treating Results

Satisfactory heat-treating results are heavily dependent upon the design of the products. For this reason, it is wise to obtain the recommendations of a competent heat-treater while new or complex weldments are in the blueprint stage of design. For example, double-walled tanks, when completely assembled prior to heat-treatment, present a problem since it is almost impossible to insure uniform cooling of both walls at the same time. As a result, one wall tends to buckle the other. For heat-treating such tanks, it would be better to make the inner and outer shells separately, heat-treat them, and then assemble them, preferably with a mechanical joint. Similarly, assembled double-walled tanks or other parts with enclosed spaces must be vented to avoid bulging or bursting due to air expansion at high temperature.

Another cause of difficulty is the not uncommon assembly of Van Stone joints, made of carbon steel, on tubular-sections or tanks. If heavy, the rings tend to interfere with heat-treatment; they also scale badly and are likely to warp during quenching. A better method is to have these rings split and welded together after heat-treatment. Inadequate consideration of deformation problems and improper heat-treatment may result in heavy re-work costs or greater loss because of the need for scrapping the part. Complete coordination between design, fabrication, and heat-treatment can do a great deal toward eliminating these difficulties.





# Techniques in Polishing Die-Castings

By T. P. BARBICANE

ANY die-cast parts can be put into service without any surface treatment other than the removal of parting-line flash because of their good as-cast finish. However, parts which are to be plated or finished with a translucent lacquer must first be brought to a high luster. The methods adopted range from wheel-burnishing to chemical-brightening treatments and barrel-tumbling, the first being the most widely employed. To some extent, barrel-tumbling has proved a substitute for abrasive-wheel operations on small parts of simple form, but the alternative most widely adopted is the use of abrasive belts driven by a standard polishing head with the addition of a back-stand or tensioning wheel.

In general, grinding and polishing are required only locally, the greater portions of the surfaces being suitable (as cast) for buffing. When grinding away a gate-stub or heavy flashroot (Fig. 1), it is generally necessary to use a wheel dressed with a coarse grit to minimize heating and loading of the wheel. This operation must be followed by polishing with a finer grit because buffing will not erase the coarse grain marks. A single belt grinding treatment with finer grit, however, will replace the two wheel operations.

Abrasive-belt grinding and polishing is often termed "back-stand polishing" to differentiate it from other methods of using abrasive belts, and the operating technique is essentially the same as for polishing on the wheel. The main feature of back-stand polishing is that the belt is driven and supported by a resilient wheel—the contact wheel-the stiffness of which varies according to the character of the work to be processed. Thus, a fairly hard felt wheel may be used when line contact is desired, whereas a soft buff which will readily deform beneath the belt is required when the latter must adjust itself to contact with a large area of a curved surface. The cutting action is greatest when the contact wheel offers most resistance to deformation by the work, and the contact area is consequently small.

When it is desired to combine a fairly rigid support for the belt with a considerable degree of deformation, formed felt contact wheels are sometimes provided. Such a wheel is shaped to suit the component as indicated in Fig. 2. The main application of formed contact wheels is for polishing those parts of components which are surfaces of revolution. These wheels cannot, in general, be used where the form of the casting departs markedly from circularity. Long, narrow components, of substantially constant section, however, such as the trim-strips used on many car bodies, can also be polished with belts running over formed felt wheels.

#### Improvements in Contact Wheels

One major improvement in contact wheels has been the replacement of the resilient cotton buff by a metal pulley carrying a rubber tire with projecting flexible vanes as shown in Fig. 3.

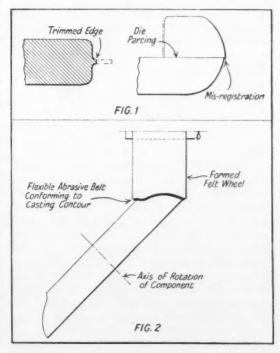


Fig. 1. (Top) Grinding of die-castings is only required when there is a heavy flash-root or a marked mis-registration.

Fig. 2. (Bottom) Abrasive belt running over formed feit wheel permits polishing surfaces of revolution.

These vanes yield to the contour of the work and return quickly to their original position. Good results have been obtained by providing helically disposed vanes, or teeth, and a number of different types of contact wheels, varying only in the details of vane form, have now been introduced. Smooth-faced wheels of softer rubber are also in use. Such wheels have the advantage that their cushioning characteristics remain constant over long periods of service.

Rubber-faced wheels can be produced to almost any desired degree of hardness by varying the number and rigidity of the supporting vanes and, to some extent, by modifying the composition of the rubber used. Consequently, a representative series of contact wheels with differing characteristics may be held in stock, and the type most suitable for a given job determined by experiment.

More recently, pneumatic type wheels have been introduced. Such a wheel may be helically ribbed in the usual manner, and can be airinflated to any desired degree of hardness. The yielding characteristics desirable for any particular piece of work can thus be accurately obtained and reproduced for further batches of similar components. It is not necessary to change wheels when changing from one work-piece to

Flexible Helical
Vanes

Work

Rubber bonded or cemented to pulley

FIG. 3

Rubber Vanes deflect under pressure

Belt

Pneumatic Contact
Wheel

Fig. 3. (Top) Aluminum pulleys with resilient rubber facings that yield to the contour of work make good contact wheels.

Fig. 4. (Bottom) Pneumatic contact wheels permit marked belt deflection and can be inflated to required hardness.

another (although it may be necessary to change belts), but only to alter the air pressure. For one type of wheel the normal range of inflation pressures is from 1 to 10 pounds per square inch above atmospheric pressure, which covers all normal contact wheel requirements.

In construction, a typical pneumatic type wheel consists of a plastic or metal core with diecast zinc-alloy end-plates and a rubber sleeve, or tubeless tire, held between the end-plates by clamping bolts. An air-tight assembly is thus provided and air can be introduced into the annular space between core and tire by way of a valve of conventional type. The bore of the wheel is shaped to engage a normal polishing-head spindle. In addition to the normal helically ribbed rubber sleeve, smooth sleeves are available.

The outstanding feature of such a wheel is the degree of flexure that it will sustain (Fig. 4), and the consequent ease with which it conforms instantaneously to the contours of irregularly shaped components. The area of work in contact with the wheel may be 20 or 30 times as great as with a conventional polishing wheel. Because of the closeness with which the wheel conforms to the work, it is claimed that the belt leaves the surface at a sharper angle than with other rubber wheels, and ejection of metal particles from the belt surface is thus facilitated. There is, therefore, little tendency for the belt to load, and the abrasive facing can be almost completely used before it is necessary to fit a new belt.

#### Vertical Belt Equipment

Although the back-stand method of applying abrasive belts has found wide acceptance, primarily because it requires only a minor addition to existing equipment, other techniques are also in use. One such technique is the Porter-Cable contour grinding machine, shown schematically in Fig. 5. Here, the belt passes over a driving pulley and a tensioning pulley, arranged vertically, and is in light contact with an intermediate idling pulley which is the equivalent of the contact wheel in a back-stand set-up. The wheel is surfaced with felt or other resilient material and may be hollowed or crowned to conform to the predominant contour of the component.

The vertical arrangement of the belt in this machine permits more efficient use of floor space. A more important advantage, however, is that the whole belt, with the exception of a short working length in front of the contour wheel, is enclosed in a steel cabinet. This arrangement facilitates metal dust disposal, also the application of lubricant or coolant to the belt. In other

Porter-Cable machines, the contour wheel is replaced either by a steel surface plate (for finishing flat areas such as flanges) or by a flat plate faced with a sheet of sponge rubber. The latter may be used for components which are only approximately flat. Large areas can be expeditiously finished in this manner, since belts with widths of 20 inches or more can be fitted where necessary.

With an alternative method of using abrasive belts, which although not novel is now finding increasing application, the contact wheel is eliminated. The belt is stretched between a driving and a tensioning pulley, and the work is brought into contact with an unsupported portion. Only narrow belts are used in this way, and the driving pulley is usually steeply crowned so that the work can be applied fairly close to it. By this method, surfaces with re-entrant curves, too small to accept a normal contact wheel, can be polished, but the sides of the belt operate less effectively than the center. It is a convenient method for dealing with the small areas around bosses, which must be by-passed when polishing with a belt and contact wheel because of the risk that the edge of the belt may cut into the bosses.

#### **Methods of Polishing Hole Surfaces**

Various narrow-belt polishing techniques are employed to some extent for the finishing of diecastings, including the so-called "yoke" sander method for polishing the walls of holes, tapered bores of reasonably large diameter, and similar purposes. This method is illustrated in Fig. 6. The equipment comprises, essentially, a largediameter driving wheel, a small idler or nose pulley carried on a telescopic arm, and two spacing-tensioning idlers. The unit will polish the inside surfaces of any opening through which the nose pulley will pass. The telescopic arm is arranged to pivot on the base in order that the working loop of the belt may be presented at any angle, and the operation is thus considerably facilitated.

Smaller holes than can be dealt with on the yoke sander may nevertheless be finished by abrasive belt, by employing the loose-belt method. A narrow belt is run between a driving pulley and a spring-tensioned idler, from which it can readily be removed. A loop of the belt is threaded through the work, placed by hand round the idler, and tensioned. The belt is thus tightened against the inside of the opening in the work, which is turned by hand, with light pressure on the belt, until the required finish is obtained. The belt is then slipped from the idler and unthreaded.

Narrow-belt techniques of this general type

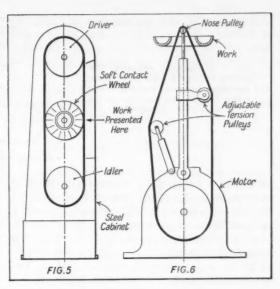


Fig. 5. (Left) Schematic drawing of a contour grinding machine in which abrasive belt passes over a driving pulley and a tensioning pulley. Fig. 6. (Right) Yoke sander has a nose pulley made from a standard 7/8-inch bearing.

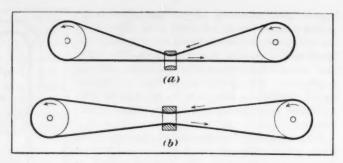
are gradually coming into wider use as their effectiveness and reliability are recognized, and are frequently known as "strapping operations" to distinguish them from methods involving the use of a supported belt. Optimum results are obtained when the belt is cutting on only one length of the loop, as at a in Fig. 7, rather than on both forward and return loops as at b. It is, therefore, desirable to set the belt tension so that the requisite pressure is attained when the return length of the belt is running freely through the opening in the work without cutting. For strapping operations the belt is usually run dry.

#### Use of Abrasive Tape on Wheels

A method of using belts—or rather coated abrasive tape—which closely resembles conventional wheel-polishing is illustrated in Fig. 8. The contact wheel, which is faced with unribbed soft rubber, is in halves. A length of abrasive tape is carried round the wheel and the two ends are clamped in the wheel joint, the halves then being locked together by a pair of conical flanges. To some slight extent, the yielding characteristics of the wheel can be modified by varying the tension with which the tape is applied over the soft rubber underlay. At normal polishing speeds, the dip in the band where the two ends are carried inward does not give rise to any difficulties.

Abrasive tape may also be applied by the Vonnegut brush-backed wheel method, which has become established as a very useful means

Fig. 7. In losse-belt strapping, belt tension should be adjusted to allow the return length of the belt to run freely through the aperture in the work-piece, as seen at a.



of polishing die-castings of markedly irregular contour. With this wheel, support is afforded for the abrasive by 16 or 32 brushes projecting radially from the periphery. A 16- or 32-ply tape is carried by a spool mounted within the hollow wheel body, and one ply is passed out in front of each brush as seen in Fig. 9. The brushes play no part in the actual polishing, but merely provide resilient support for the tapes.

A feature of this method is that the free end of each tape, being exposed, gradually frays out in service, and an effect very similar to that of a fabric wheel is produced. As the abrasive is consumed, the spool of tape is rotated and fresh lengths are brought into operation. The frayed ends of the tapes enter the smallest grooves and

Ends of Tape
Clamped between
Pulley Halves

Conical Boss

Abrasive Tape

FIG. 8

Abrasive
Tape

Work

Deflecting
Bristles

Brush
Holder

FIG. 9

Fig. 8. (Top) For wheel-grinding, an abrasive tape can be carried round a split rubber-faced pulley and clamped between the two halves. Fig. 9. (Bottom) On this brush-backed wheel, tape is fed from an internal magazine through a slot in rim.

recesses, enabling a good all-over polish to be obtained even on work-pieces which have very irregular surfaces.

#### Wet Belt Grinding

Abrasive-belt grinding and polishing are carried out both wet and dry. Wet belt grinding, as a distinct technique, has been developed only since the use of synthetic waterproof adhesives became general. Cabinet type machines, arranged so that only a small part of the belt is exposed, are to be preferred for the wet process, in which the belt is sprayed continually with water containing a small proportion of cutting oil. For zinc-base die-castings, some users prefer to spray with paraffin, and this medium is always employed when grinding or polishing magnesium components. The main advantage of wet belt grinding is that loading is much reduced and belt life consequently increased.

There is, moreover, considerable evidence to show that with wet belt grinding it is possible to use a coarser grit, with a faster cutting action, to obtain a given finish. Thus, a wet belt of 60 grit and a dry belt of 80 grit give approximately the same results so far as appearance is concerned. As the grits become finer, the differential is reduced, but, for a given grit, the wet belt always cuts faster.

For back-stand operations, belts are often treated intermittently with a grease stick in the same way as an ordinary dressed wheel, but manufacturers of polishing compounds are now developing lubricants specifically intended for belt work. For the most part these lubricants are of such a consistency that they can be sprayed on the belt under pressure, either continuously as a finely divided spray, or intermittently as a coarser spray. Sometimes the operator controls the application of the lubricant by means of a foot pedal or knee-operated valve.

#### **Developments in Automatic Polishing**

An impetus toward automatic and semiautomatic polishing sequences has resulted from the development of the new methods. Some of the larger users of die-castings have recently made provision for completely automatic polishing sequences in which belts are used for cutting-down and polishing prior to buffing. By these means, processing costs have been greatly reduced, although considerable capital outlay is involved. Manual processing, however, even with the newer methods, is often a very heavy item of manufacturing cost, and the introduction of automatic polishing for quantity-produced parts offers the only practicable means of reducing it.

As in many other applications of automation, the requirements for automatic polishing are a series of fixed work stations, a means of transferring the work successively to each, and a loading and unloading station. The various systems at present in use differ mainly as regards the means provided for transfer. The simplest method involves the use of a rotary table, which may carry as many as 50 work-holding fixtures, and as many independent polishing heads, with belts or buffs, as may be required. These units are almost invariably free-standing, pillarmounted, and independently motorized, the mounting being jointed so that the position and angle of presentation of the abrading surface can be universally varied. Owing to these features, it is fairly easy to re-set the heads to suit a change of work.

### Rotary Polishing Installations

Rotary automatic polishing installations differ according to whether the work-holders are fixed or rotating. The latter are more generally used for tubular or press-drawn work than for diecastings, since only circular or nearly-circular forms lend themselves to rotation under the buff. A further distinction may be made between rotary installations in which the table movement is continuous or intermittent. With the latter, the table moves to bring a piece of work under each head and then remains stationary for a predetermined period. This system is, of course, only applicable where provision is made for moving the work-piece itself in relation to the head while the table is stationary.

Automatic sequences may, in appropriate cases, include non-polishing operations such as flash removal. In Fig. 10, for example, an installation incorporating a ten-station table and a flash lathe is shown diagrammatically. There are three working stations, at the first of which a heavy peripheral flash is trimmed prior to the presentation of the work to a belt and a buff. Since the work-holding fixtures revolve continuously, it is a simple matter to include minor machining operations in the sequence.

For components of contoured form it is often

necessary to arrange for the fixture to lift, swing, or tilt as it passes the working station, in order that successive portions of a contoured face may be presented to the wheel in substantially the same manner and with the same pressure. Such fixtures are, of course, suitable for only one design of component and must be specially mounted for each job.

### **Design of Polishing Fixtures**

Presentation fixtures, or conforming fixtures as they are sometimes termed, should always be kept as simple as possible in design since it is often necessary to construct as many as 12 or 20. In general, it is better to increase the number of work-heads than to employ elaborate fixtures, since the work-heads are standard equipment and can be as closely grouped around the table as may be required. Thus it is often preferable to polish a face with pronounced curvature in three or four separate stages rather than to move it under a head so as to polish the whole area at one pass. In this connection, however, much depends upon the number of different operations included in the cycle.

The difference between the two methods is indicated in Fig. 11, which depicts two conforming trailer type fixtures. Each comprises a plate, pivoted at the leading end to a base fixed to the table, and incorporates means for clamping in position a component, on which a face of the form (indicated by dot-dash lines) is to be polished. In each instance, the pivoting plate is spring-loaded to hold it away from the polishing head. The left-hand fixture has a transverse

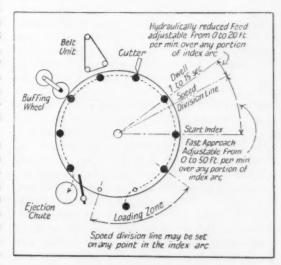


Fig. 10. At successive positions on this ten-station indexing table, a heavy peripheral flash is removed with a turning tool, and the parts are polished and buffed.

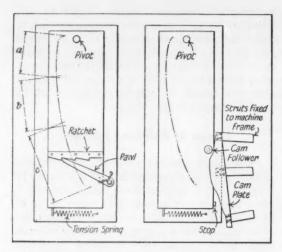


Fig. 11. Two trailer type conforming fixtures having spring-loaded pivoting plates. On the fixture at left, pawl and ratchet arrangement positions work, while cam is used on fixture at right.

block on the trailing plate which is notched in three places, and an engaging spring-loaded pawl is mounted on the base.

In operation, the work is loaded with the pawl in the most advanced position, so that the forward end of the work-piece is presented to a belt with its contact wheel on an appropriate pitch circle for polishing the sector a. As the work draws away from the belt, a fixed arm contacts a peg on the trailing plate and swings it, against spring pressure, outward toward the table periphery. This travel is slightly more than sufficient to enable the pawl to enter the next notch, and, when the pin moves clear of the fixed arm, the plate drops back slightly and engages firmly with the pawl. In this position, the next sector of the work is presented to a belt passing over a contact wheel and sector b is polished. Similarly, when this belt has been cleared, the fixture is moved forward another notch to polish the third sector c.

The fixture on the right of Fig. 11 operates in a different manner. Instead of the pawl and pin, the trailing plate carries a free-running cam roller. Normally this roller is inoperative, the trailing plate being held back by the spring against a stop on the base-plate. As the work approaches a processing station, however, the cam roller begins to ride up a track cut on the edge of a fixed steel plate carried by the table superstructure. This track is so formed as to bring the forward edge of the work into contact with the belt or wheel as soon as the fixture is lined up with the polishing head.

As table movement continues, the cam-track guides the fixture so that contact between the work and the wheel is maintained despite the changing contour of the former. In practice, it is often difficult to achieve this result with a simple pivoting fixture, and it is sometimes necessary to allow for free radial movement of the work-holder and to control the positions of both ends by a pair of rollers and tracks. The example, however, serves to show the essential difference between the two methods.

### Straight-Line Installations

In straight-line automatic installations, which for many purposes are preferable to rotary arrangements, some type of endless conveyor is used to transfer the work from one station to another. For small parts that can be easily and rigidly located without clamping, a narrow slat conveyor, with the slats extending horizontally, is often adopted. The fixtures are secured to the slats, the work is loaded at one end and unloaded at the other, and the empty fixtures are carried back on the underside of the conveyor.

For heavier work, and particularly where the fixtures must slide laterally, a heavier type of slat conveyor is often provided. Here again, loading and unloading are performed at opposite ends, but, in addition, the fixtures themselves are lifted off at the unloading station and returned for re-loading by means of a tilted length of roller conveyor extending back to the loading end. The return length of the conveyor is thus relieved of the weight of the fixtures.

With a modification of this method, a simple endless chain is utilized instead of a slat conveyor. The chain runs between a pair of ways along which the fixtures are carried, the latter being picked up by latches on the chain as it rides over the idler sprocket. The ways project beyond the driving sprocket, at which the latches are disengaged. As a result, two or three fixtures can, if necessary, be successively delivered at the unloading end without the need for attention from the operator. Each plate, as it approaches the point where the latch disengages, pushes forward any plates already disengaged which may be ahead of it. Return of the fixtures is effected by means of a roller conveyor.

Among other straight-line installations may be noted the double-sided type, in which either an endless conveyor with both runs in the same horizontal plane is used, or two parallel conveyors with opposite motions and a transfer feed at one end. This latter arrangement has the advantage that the mounted work is facing in the opposite direction on the return run, so that it is possible to present portions of the surface for polishing which are not readily accessible on the forward pass.

It will be appreciated, however, that no automatic polishing installations can be expected to produce results equivalent to those obtained by hand work. On very few die-cast components are the contours so simple that the whole surface can be effectively belt-polished or buffed at a single pass beneath four or five heads. Consequently, a certain amount of hand work is almost invariably required on components of any

appreciable size, and it is better to recognize that this is inevitable than to design fixtures of great complexity in an attempt to obtain complete coverage of the work surface.

The Doehler-Jarvis organization, in many such instances, makes provision for touching up the component with a portable, manually held polishing head as the fixture swings round to the return lap of the conveyor.

### **Tubes Blown into Solid Mill Sheets**

SHEETS of solid copper, brass, or aluminum in which tubes are inflated to desired running lengths in a variety of shapes and sizes have been developed by the research department of Revere Copper & Brass, Inc., Rome, N. Y. Called "Tube-In-Strip," the new product is said to have wide application in the heat-exchange field, including refrigeration and air conditioning, radiant panel heating, and chemical, food, and petroleum processing. The sheets may eventually be used for automobile radiators, water heaters and coolers, gas heaters, and electronics equipment.

Except for the expandable portions, the metal is a solid strip derived from a suitably treated casting. As rolled, Tube-In-Strip is not discernibly different from conventional mill products. The material can be shipped economically in coils or flat, and the user inflates the tubes pneumatically or hydraulically. It is available in widths up to 16 inches at present, the determining factor being the size of the billet from which it is rolled.

The metal can be stamped or drawn prior to blowing the tubes. These can be round in section, or (during the blowing) the metal can be forced into dies to develop special non-circular sections. It is also possible to inflate the tubes on one side of the sheet, leaving the other side flat.

Center spacing of the tubes can be as close as 3/16 inch to as much as the width of the sheet will permit. Inside diameters of the tubes can vary from approximately 3/16 to 5/8 inch, when flat, and tube wall gage, from 0.0025 inch to whatever is possible with available inflating equipment. Tube diameters can be identical or different within the same sheet. Conventional techniques are used to join Tube-In-Strip to other components. Manifolds are easily produced either before or after inflating, and return bends can be brazed, soldered, or welded readily.

Tube-In-Strip can be inflated in a coil of any length.

Ordinarily, the coil is shipped flat. Lower half of coil illustrated has not been inflated.

Opportunities for major economies are afforded, Revere claims, because the user saves, first, in buying tube and strip together, already fabricated to his specifications; and secondly, because Tube-In-Strip makes new and improved designs possible. The web between the tubes conducts heat quickly, and the superior structural strength provided by the integral tubes means that lighter gage metals can be substituted, with resulting savings in weight and price.



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# **Submerged-Arc Welding Boosts**

# Clutch Disc Production

S PRING - DAMPENER hubs for one model of driven disc assembly are now being fabricated by welding at the Lipe-Rollway Corporation, Syracuse, N. Y. A single operator can weld this member by the submergedarc method at a rate of 110 pieces per hour.

Forging was formerly used to produce this part. Several secondary machining operations were then required, such as turning the hub flange periphery, facing both sides of the flange, piercing windows and holes, and turning pilot diameters. The only secondary opera-

tions required with the welding procedure are heat-treating, turning the pilot diameters for a steel disc and a spring-retainer plate, and cleaning.

Conventional welding techniques for joining a stamping to a turned part did not provide the uniformity of bead necessary to perform closetolerance machining of the weld. As a result, a submerged-arc welding set-up, complete with



automatic cycling, was installed. The unit is a Lincolnweld machine having an automatic head and wire feed. The bead laid down by this machine, which can be seen in the heading illustration, can be machined to the desired diameter of 1.968 inches, plus or minus 0.002 inch. Band width of the pilot diameter is the same for both sides, 5/32 inch.

Since clutch components are subjected to se-



Fig. 1. Ram shaft has been lowered to position clutch disc in propara ion for submergod-arc welding. Flux has been removed for clarity.

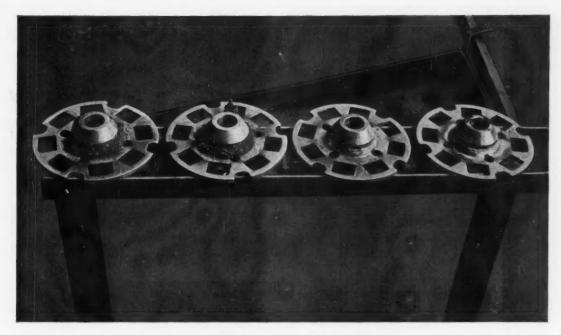


Fig. 2. Simple rack is used to support discs immediately after welding. When cool, the weldments are tumbled to remove caked flux.

vere loads, particularly those of torque, the weldment must have a deeply penetrating joint and a sufficiently large weld bead to allow a uniform pilot width to be turned. To fulfill these requirements, welding machine current is reduced by one-third during overlap—from 600 to 400 amperes. Effective voltage is held between 28 and 30 volts. Should either the amperage or voltage become too high, resulting arc blows will create a depression, or crater, in the bead. As a precaution, power input to the welding machine is checked constantly by the operator.

The stamping of 1040 type steel is positioned on a fixture, as can be seen in Fig. 1. Then the hub, which is machined from 1137 type steel, is set in place by a pilot ring and permanently positioned by a ram slide, as shown. No preheating is required. The copper-coated steel electrode wire is submerged in the granular flux (not shown in Fig. 1 for clarity) as the fixture rotates. Approximately 30 inches of electrode wire is required for each weld.

In spite of the high sulphur content of the 1137 type steel, a non-porous weld is obtained by rigid control of the specially formulated flux. In addition, the flux absorbs the gases given off during welding and acts as an insulating shield to permit handling of the part soon after the operation is complete.

A simple rack, Fig. 2, supports the weldments until they have cooled. They are then placed in tumbling barrels to remove the flux cake from the bead. Following this, the welding operation is repeated on the opposite side of the part. A minor fixture change-over enables both welding operations to be performed on the same machine.

After the discs have been welded on both sides, they are heat-treated to remove internal stresses. Pilot diameters for the steel disc and spring-retainer are then turned on a lathe. Finally, the pieces are cleaned with soap and water to remove all traces of oil and dirt.

Reports from the company's testing laboratory have shown that the welded parts have the same strength as the original forgings. Frequent quality checks during production and fewer secondary operations have held off-tolerance rejects to a minimum.

### Sintered Carbide Structure Bonded to Steel Surfaces

A method of applying thin layers of tungsten carbide to steel surfaces, developed by engineers of Carboloy Department of General Electric Co., Detroit, Mich., is reported to form a metallurgical bond with the base material. The technique is said to provide a sintered carbide structure.

To date, Carboloy engineers have been successful in coating such items as capstan rings, drill jig bushings, and cylinder linings, the coatings being applied in thicknesses up to 0.030 inch. The new method may overcome certain designing limitations associated with solid carbide parts.

# Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

### Series of Hardenable Stainless-Steel Alloys Now Available

A series of corrosion-resistant precipitation-hardenable stainless-steel alloys has been announced by the Research Division of Cooper Alloy Corporation, Hillside, N. J. Designated PH55A, PH55B, PH55C, and PH20, the alloys were developed to meet the following needs: PH55A—a high-strength and high-hardness alloy with fair ductility, for erosion and abrasion resistance or for stressed parts in corrosive applications; PH55B—a ductile high-strength alloy of medium hardness, for shock resistance and high stresses in corrosive applications; PH55C—a very high hardness alloy of low ductility, for non-stressed, corrosion-resisting parts; and PH20—a gall-resistant alloy with corrosion resistance.

The PH55 series alloys are variations of the 19 per cent chromium and 9 per cent nickel analysis. By introducing and varying the amount of molybdenum, copper and silicon and controlling the carbon below 0.08 per cent and the manganese below 1 per cent, variations in hardness and ductility were achieved. The corrosion resistance of these three alloys is comparable to that of 316 stainless. PH55A, B, and C have Brinell hardnesses of 341, 293 and 415, respectively.

PH20 is a precipitation-hardenable version of the 20 per cent chromium and 29 per cent nickel Type 20 alloy. It has good resistance to hot sulphuric acid and many other corrosive solutions. This alloy can be hardened to an average Brinell hardness of 229.

### Heavy-Duty Emulsive Coolant that is Rust Inhibiting

A heavy-duty emulsive coolant with extreme pressure properties has been developed by the Texas Co., 135 E. 42nd St., New York 17, N. Y. for cutting, boring, and broaching operations. This coolant, called "Texaco Soluble Oil HD," mixes readily with temperate hard or soft water, providing a highly stable emulsion with good rust-inhibiting properties. It can be used with

carbide and high-speed steel tools in automatic operations, and in many instances, in place of a cutting oil. When used under conditions where a cutting oil would smoke, this coolant utilizes the heat-transfer properties of water and functions efficiently under extreme pressure without smoking.

## Organo-Silicone Compounds with Lubricating and Solubility Properties

Six organo-silicone compounds that exhibit unusual lubricating and solubility properties have been announced by Linde Air Products Co., Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Known as X-520, X-521, X-522, X-525, X-526, and X-527, these compounds have good release properties, are stable, and lubricate and impart antiwear properties in a manner similar to petroleum oils. Four of the compounds are water-soluble and two are soluble in both high and low aromatic solvents. They are being used as special lubricants, as release agents for rubber and plastics, and as emulsifying agents or emulsion breakers.

### Casting Scrap Loss Reduced by Using Aluminum Putty

An aluminum putty, which consists of approximately 80 per cent aluminum and 20 per cent plastic, is now being used by several automotive companies, machine shops, foundries and other concerns for filling very large and small holes in aluminum and steel castings, to cover holes which have been drilled incorrectly, and to build up worn sections. The filled in portion when machined has an appearance almost identical to aluminum or polished steel. This material, designated Devcon F by the Chemical Development Corporation, Danvers, Mass., its producer, is as easy to use as modeling clay. A large mass can be applied to a vertical surface and will not run or sag. No special skill is required.

The putty will adhere to aluminum and steel, and also to bronze, brass, and cast iron. It will

bond to a flat surface and can be machined to a feather edge. It is not necessary to under-cut the metal or treat it in any special way. No volatile solvents or thinners are used; therefore the material will not shrink or pull away during hardening. The hardener is added to the material and mixed with a screwdriver or a nail. Two hours after mixing, the mass becomes rigid, strong and tough. This hardening period can be reduced to a few minutes by the use of heat. Once hardened it is durable and permanent and can be drilled and tapped or machined with regular metalworking tools. It will not crack or flake off during later machining.

This material can be sand-blasted or treated in a Pangborn or American Wheelabrator or similar machine. It can also be painted with standard coatings and then baked. It will not bubble, shrink or run at regular baking temperatures.

## Porous Metal Casting Sealed by a Resin

Porous metal castings are now being sealed with a resin compound called Impco RC-2 which has been prepared by Impco, Inc., Cranston, R. I. Of particular value to the aircraft industry where porous engine component castings would leak oil, this compound can be used to seal castings in less than five hours. Metals which can be sealed are cast iron, magnesium, copper and aluminum alloys.

In use, the casting being treated is placed under a vacuum to remove all air in the pores. After this it is placed in a pressure vessel where it is impregnated with the sealant. The casting is then rinsed with warm water and a mild detergent to remove the excess resin. After rinsing it is placed in a tank of hot oil to cure at 270 degrees F. for a period of from sixty to ninety minutes.

## Match-Plate Metal Now Employed for Castings

The use of Salloy, an aluminum alloy specifically designed for making match-plates in the foundry and die-casting industries, as a casting metal for special applications has been announced by the Metallurgical Department of The George Sall Metals Co., Inc., 2300 E. Butler St., Philadelphia 37, Pa.

It is said that on jobs where a highly polished surface is required, this alloy, which is closegrained and takes a good polish, facilitates the operation. Its cost is higher than standard aluminum alloys, but the results obtained and the low number of rejects usually mean less overall cost in the finished product.



Metal pieces like these can be bonded to each other using "Bondmaster M620," a one-part epoxy-based paste adhesive, without changing position of the pieces during curing.

#### One-Part High-Strength Epoxy Adhesive Bonds Metal

A single-component high-strength epoxy-based adhesive that can be used to bond metal to metal or to rigid plastic has been announced by Rubber & Asbestos Corporation, Dept. P, 225 Belleville Ave., Bloomfield, N. J. Called "Bondmaster M620," its use eliminates the need for mixing a separate resin and hardener. It has a smooth buttery consistency which enables it to be spread on parts being bonded to the proper depth using a brush or spatula. The material does not "drip" or "run" either before or after curing. The minimum curing time is from 7 to 10 minutes at 535 degrees F. It can also be cured by subjecting it to a 260 degree F. heat for from 20 to 24 hours. The illustration shows some sample metal joints.

### Supplement Increases Effectiveness of Sulphur-Base Cutting Oils

A supplement for sulphur-base (hydrocarbon) cutting oils that increases heat dissipation, promotes long tool life, and makes possible deeper and faster cutting without chatter—resulting in a better finish on the material—has been announced by the Iso-Mite Corporation, 4470 E. Washington Blvd., Los Angeles 23, Calif. "Kut-O-Mite," which is the designation given this supplement, is 100 per cent inert and will not cause skin irritation or contamination. It is used in the proportion of 1 pint of supplement to 10 gallons of cutting oil.

# **Drill Bushings Made from Bolts**

A DIFFICULT problem arose at the Temco Aircraft Corporation, Dallas, Tex., when jig builders tried to anchor conventional drill bushings in jigs and fixtures constructed of poured and laminated plastics. As the bushings were only 1/2 inch long, they did not have sufficient threaded area to hold them securely in place. After a relatively short period of hard usage, they would loosen.

The leadman of the jig making department conceived the idea that reamed bolts might be substituted satisfactorily for standard bushings. A regular bolt was found to be long enough to have a firm grip in plastic and strong enough to withstand daily wear from drills if casehardened. Since the original bolt was tried out, the Temco shop has made several hundred bushings from 1/4- and 5/16-inch bolts. The bolts are drilled and reamed in a turret lathe at the rate of about sixty-five an hour and then casehardened.

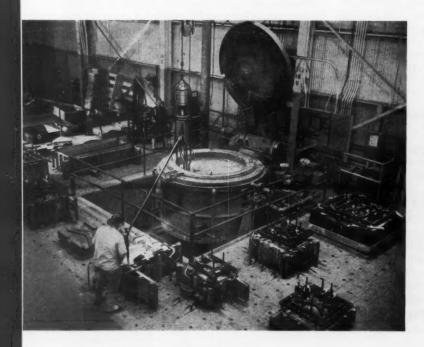
A 1/4-inch bolt is recommended for use with drills up to No. 30 and a 5/16-inch bolt for drills from No. 30 up to 9/64 inch. In these sizes sufficient wall thickness is retained after reaming to insure long life. Some of these bolt-bushings have been in use for four months without appreciable wear.

The bolts may be installed in wet plastic, but



Drill bushings made from standard bolts for use in plastic jigs are drilled, reamed, and casehardened.

they are usually assembled in dry material after holes have been drilled and tapped to receive them. Because of their comparatively small heads, bolt-bushings can be readily used in drilling closely spaced holes.



Kirksite flows from melting pot to flasks by use of a pump and pipeline at the Torrance, Calif., foundry of the Douglas Aircraft Co. The
pump, designed and built by company engineers, takes the place
of a ladle, and can be elevated
and moved out of the way when
the pot lid is to be closed. The
flasks contain molds for drophammer dies, and are positioned
around the pot area.

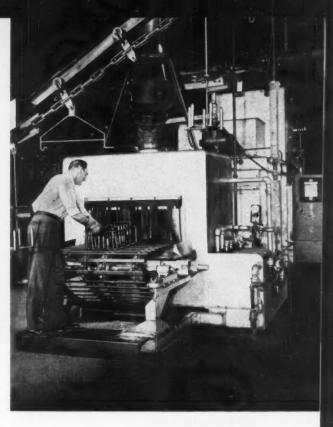
# Heat-Treating Parts for the Buick Dynaflow

By HERBERT CHASE

INCREASED production of the Dynaflow automatic transmission has made it necessary for the gear-making department of the Buick Motor Division Plant, Flint, Mich., to alter and expand its facilities for heat-treating. Among the new units installed are Cincinnati Flamatic machines, a Tocco induction heater, several Dow batch type furnaces, and a Surface Combustion continuous furnace.

One of the most interesting of the automatic flame-hardening jobs is that on the reaction shaft, shown in process on the Flamatic machine in Fig. 1. The part is tubular and made of SAE 1062 modified steel. Three bands on the part must be surface-hardened to 60 Rockwell C for a depth of 0.050 inch.

In the cycle, a shaft rolls from a magazine onto a pneumatic slide which thrusts it forward, aligning it with the machine centers. The head-



stock center, retracted for loading, then advances to pick up the shaft and revolves it for the heating. (Both centers are water-cooled.) At the same time, a mixture of propane and oxygen is automatically turned on and ignited, jet flames impinging radially on the shaft. All bands are heated simultaneously for a specified

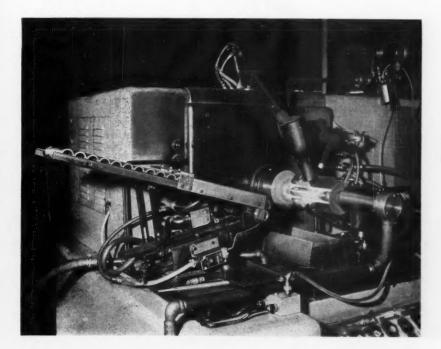


Fig. 1. The shaft is revolved between centers while being heated, then dropped into a quenching tank.



Fig. 2. Flames issuing radially outward from the burner heat the internal teeth of the converter hub as it revolves.

time of ten and one-half seconds, after which the headstock center retracts and the shaft is dropped into an oil quenching tank. Coming to rest on a wire-mesh belt, the shaft is slowly lifted out of the tank.

On the machine are the necessary controls for the supply of propane and oxygen, as well as a temperature-regulating instrument. Timers direct each step in the cycle, so that the operator has only to keep the magazine loaded.

In the set-up seen in Fig. 2, the internal teeth

of the converter hub of the transmission are flame-hardened. The part is mounted manually in a fixture on an arbor which is retracted for loading and advanced over a burner for heating. Flames shoot outward onto the teeth for an eleven-second interval. When retracting the arbor, the hub is stripped off and dropped into a quenching tank.

Hardening a sun gear of the converter unit is illustrated in Fig. 3. Rapid and uniform heating is produced by internal and external burners

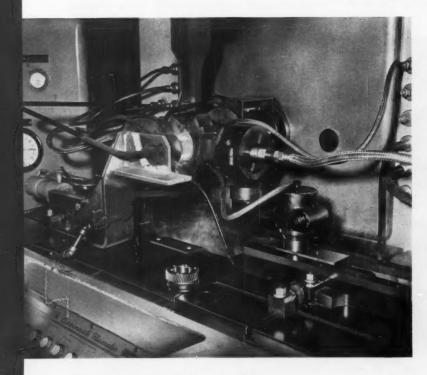
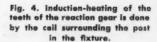


Fig. 3. In heating the sprag-well and teeth of the sun gear, flames are directed both inside and outside the work in a completely automatic cycle.

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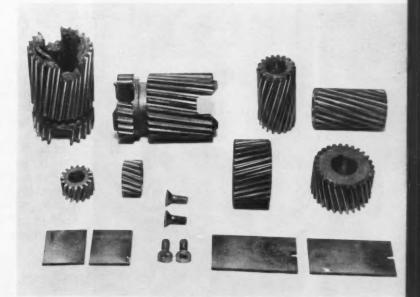
as the first step in through-hardening the spragwell and the external teeth. Interval heating lasts twelve and one-half seconds, with the internal burner starting a few seconds before the external one. Both burners are controlled automatically, and as soon as heating is completed, the part is stripped from the work-holder and falls into a quenching tank.

Teeth of the low-range reaction gear are hardened to specified depth below the root diameter in a Tocco 20-kilowatt, 450-kilocycle machine. Fig. 4 is a close-up view of the lower half of the fixture and the heating coil. A cup centered on a post holds the coil in place. The part is contained in the upper half of the fixture,

which is motor-driven and located over the cup. Current is turned on and the teeth are heated rapidly. After a timed interval, the current is shut off and the cup is filled automatically with quenching oil that is pumped through a series of holes in the post. The part revolves during heating and quenching. Oil drains from the cup as a completed gear is unloaded and a new one loaded. About 120 reaction gears per hour can be handled through this heat-treatment.

All flame-hardened and induction-hardened parts are put through a draw furnace, seen in the heading illustration, after being washed to remove quenching oil. This is a recirculating type, continuous furnace in which the parts re-

Fig. 5. Typical gears and other parts of the Dynaflow transmission that are carburized in batches. Handling work in baskets permits rapid circulation of gas.



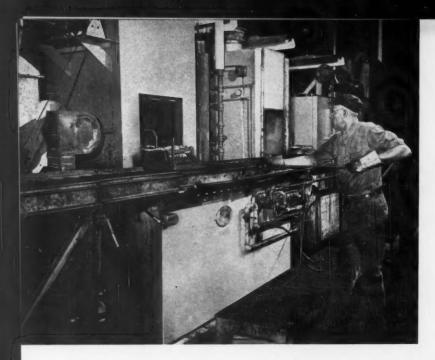


Fig. 6. In this view is shown a tray of parts being pushed into the vestibule of one of the carburizing furnaces.

main for one and one-half hours at a temperature of 300 degrees F.

Batch carburizing of parts such as appear in Fig. 5 is accomplished in a row of Dow furnaces. RX generators supply the carrier gas for the atmosphere, containing about 15 per cent

natural gas and 1 per cent ammonia. This gas is circulated by a high-temperature fan inside each furnace, passing through and around the parts baskets and over radiant tubes heated by natural gas. A temperature of 1525 degrees F. is maintained in the furnaces by automatic controls.

Cycle time is commonly one and three-quarters to two and one-quarter hours, but varies with the furnace load and with case depth required. Constant motion of the hot gas through and around all parts is assured by loading them in wire-mesh baskets over trays, or in containers having wire-mesh bottoms.

Fig. 6 shows a load of stacked trays being pushed into a vestibule, and Fig. 7, a container of parts for transfer to a furnace vestibule. As soon as a furnace charge is ready for quenching, it is pulled manually from the furnace and lowered into the quenching oil, which is circulated constantly and held automatically at 325 degrees F. Parts remain in the oil for ten minutes. To maintain a uniform oil temperature, the tanks contain a tube through which air or combustion products circulate, depending upon whether heat is to be extracted from the oil or supplied to it.

In batch type furnaces, 250 pounds are carburized per hour. A much larger tonnage is handled through a Surface Combustion continuous furnace which has an enclosed discharge vestibule over the oil quenching tank, held at 350 degrees F. In this furnace, the entire cycle is automatic.

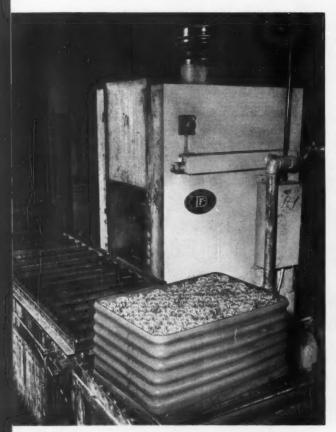
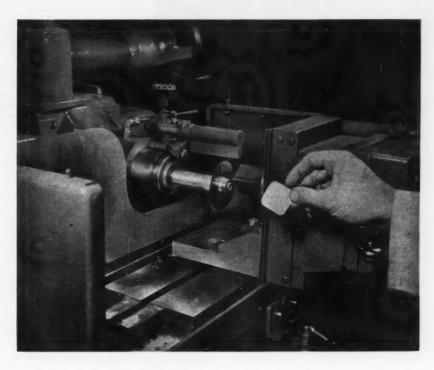


Fig. 7. Container filled with gears being elevated to the level of the furnace conveyor.



# **DoAll Machine Speeds Transistor Production**

HE introduction of a compact slicing and dicing machine augurs well to give even greater impetus to the booming production of transistors. These are small, static electronic devices which replace vacuum tubes in much of the military and commercial equipment being designed today. The advantages of the transistor are that it operates on a fraction of the power necessary for the vacuum tube, requires little space, and has exceedingly long life.

Preparation of the thin, small sections of germanium or silicon, which comprise the heart of the transistor, is speeded on the new machine, called a "Microtomatic." It is a product of the DoAll Co., Des Plaines, Ill. A close-up view of the machine appears in the heading illustration. The work, in the form of a small ingot of the crystalline material, is sliced at high speed into wafers by a diamond-impregnated metal wheel. Subsequently, batches of these wafers are grouped on the machine table and diced to size by a gang of slitting cutters.

For the slicing operation, the table moves the ingot toward and past the diamond wheel, cutting off a wafer. The table reverses, executing a

rapid return, cross-feeds a short distance to index the work, and the cycle is repeated. Feeds from 0.010 to 15 inches per minute can be selected, with a rapid return of 30 feet per minute. The increment of cross-feed, or index, is adjustable from 0.005 to 0.250 inch, and to an accuracy of 0.001 inch. This increment is determined by the desired thickness of the wafer plus the kerf of the wheel.

Recessed-center wheels are used for slicing. Those currently available are from 3 to 6 inches in diameter. Wheel thickness is only 0.010 inch, with the thickness of the diamond edge only 0.015 inch. Because of the high cost of the material (\$400 to \$600 per pound), it is important to use the thinnest wheel possible. Wheel speeds ordinarily range from 6000 to 10,000 surface feet per minute; maximum speed at which a wheel can operate safely is 14,000 surface feet per minute.

At present, two methods are generally used to support the ingot. In both, a transparent thermoplastic cement secures the work to a ceramic block. This block, in turn, is fastened to an angle-plate, as in the heading illustration and



Fig. 1. The ingot is held against an angle-plate and engages the diamond cutting wheel along a radial line.

in Fig. 1, or directly to the table, as in Fig. 2. Where an angle-plate is used, a rubber pad is placed over the table to protect the brittle wafer as it falls free.

One particular advantage of the angle-plate set-up method is that the feed-stroke is considerably shorter. Rotating the ingot by means of a motorized work-head, as seen in the heading illustration, has not resulted in any appreciable advantage, and has been discontinued. Parallelism within 0.00025 inch and a surface finish of 4 or 5 micro-inches r.m.s. are obtained as a matter of routine for wafers 0.020 inch thick, and satisfy current requirements.

However, the production of still thinner wafers is an objective of the transistor industry. The thinnest wafer or slice that can now be produced consistently on the Microtomatic, using a 0.015-inch thick diamond wheel, is 0.010 inch. Wafers as thin as 0.005 inch have been cut, but clipping and breakage were encountered. Where such thin wafers are required, they are sliced thicker, then lapped and etched to size.

The dicing operation, illustrated in Fig. 3, is performed with as many as twelve straight-side wheels which are mounted as a gang. The wafers are cemented to ceramic blocks clamped to a fixture. One cut is made the length of the fixture. The blocks are then turned 90 degrees and another cut made. Feed rate is 1 1/2 to 2 inches per minute. Normally, a lapping operation precedes the dicing.

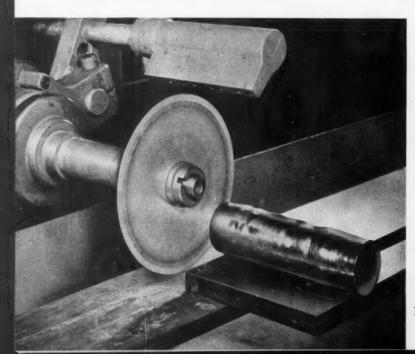


Fig. 2. Here, the ingot is cemented to a block secured to the table, and enters the diamond wheel tangentially.

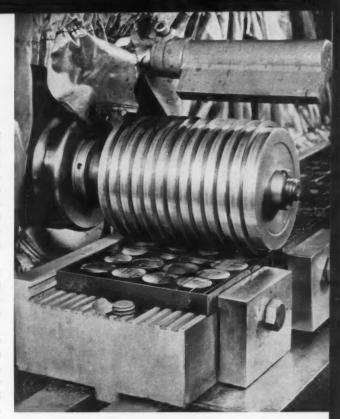
Fig. 3. Two cuts are taken to dice the wafers.

After the first cut, the ceramic blocks holding the wafers are turned 90 degrees.

Diamond wheels for both slicing and dicing are similar as to grit, concentration, and hardness. They are available in from 24 to 400 grit, and from 25 to 100 concentration. A good general-purpose metal-bond diamond wheel for germanium and silicon has a 180 grit, 100 concentration, and N hardness, with a diamond section 1/8 inch deep. Coarser grit wheels are satisfactory for cutting harder materials, such as quartz.

After prolonged use, the diamond surface may become glazed, causing a reduction in the rate of cut or loss of parallelism. Dressing the periphery of the wheel lightly with an aluminum oxide abrasive stick will remove this glaze.

Coolant is used with all diamond wheels. Because of the possibility of contamination of the high-purity germanium or silicon used in transistor production, plain filtered water is preferred. A light grinding oil is used as a coolant for quartz and other hard crystalline materials.



### Obsolete Lathe Converted for Machining Jet-Engine Discs

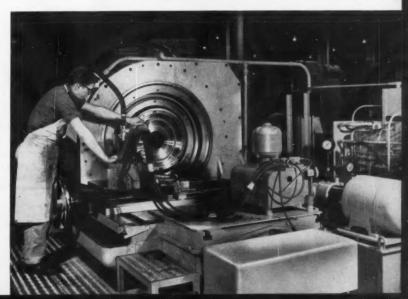
In machining compressor discs for the J-57 jet engine, the Ford Aircraft Division encountered considerable trouble. The stainless-steel discs have a varying cross-section, which narrows to a thinness of 1/8 inch in one area. This caused a tendency to "dish" if too much tool pressure was applied. Also, processing time and scrap were high because each disc had to be machined at least six times.

These problems were solved economically by converting an obsolete Wickes center-drive lathe for contour-machining the discs. With the center-

drive feature, it is possible to machine both sides of the disc simultaneously. The lathe was stripped to its base; new ways and carriages were installed; a hydraulic tracing unit was incorporated; and different feed mechanisms with proper ratios were built in.

Tools now work opposite to each other at all times, eliminating the "dishing" and other distortion problems formerly encountered. Set-up time has decreased 75 per cent; output has doubled; quality has improved tremendously; and scrap losses are negligible.

Obsolete center-drive lathe was converted to turn discs for the J-57 jet engine. Tools work opposite to each other at all times, eliminating "dishing" and other distortion problems.





# Rapid Method of Flanging Metal Strips

N almost endless variety of metal strips with one or more flanges that must be produced by bending is required in the fabrication of airplanes. Typical parts of this classification are seen on a panel board in Fig. 1. They are being pointed to by Lin Brady of the sheet metal department in the Santa Monica, Calif., plant of the Douglas Aircraft Co., who developed a machine that facilitates the forming of this type of work.

Extending along the front of the machine, as shown in Figs. 2 and 3, is a table about 8 feet in length on which the work is placed for bending over forming block A. In back of the work is a small anvil B which is attached to a stationary member of the machine. When the work and forming block are in this position, the operator moves the control lever C to actuate the machine. The hinged unit D at the front of the machine swings downward from position seen in Fig. 2 to bring finger E against the front of the form block and lock it securely against the work and the anvil for the operation. The finger is seen in the clamping position in Fig. 3. The movement of unit D is actuated by a pneumatic cylinder.

After the work has been securely clamped, a horizontal slide in the main housing of the machine is moved forward by the action of a second air cylinder to "wipe" a roll-shaped tool supported by two arms F over the vertical edge of the work, and bend it into the required flange. Wiper tools up to 12 inches long are being used at present, although longer rolls could be used if the work required them.

When long strips or sheets of work such as shown in Fig. 3 are being handled, the sheet can be moved progressively along the anvil and clamped any required number of times to permit

Fig. 1. (Top) Variety of flanged aircraft components that can be rapidly produced on a special machine used in one of the plants of the Douglas Aircraft Co.

Fig. 2. (Bottom) View of the Brady forming machine with clamping unit raised from contact with form block.

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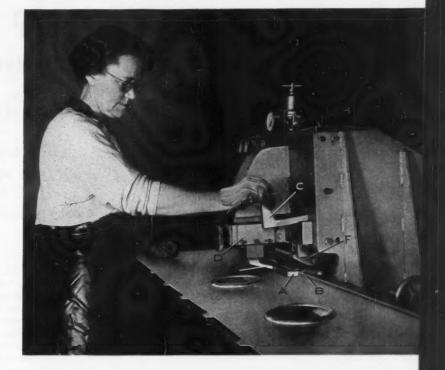


Fig. 3. Another view of the Brady forming machine which shows the arrangement of the wiper tool during an operation.

forming a flange the entire length of the work. Several flanges can also be bent on the same piece of work by using appropriate form blocks in succession. The form blocks can be of a curved

contour along their vertical plane, as well as straight. The clamping finger E is mounted on a slide that is adjustable in its housing to accommodate form blocks of various widths.

### **Epoxy Adhesive Reduces Grinding Wheel Rejects**

A thin-wall aluminum insert is shown being forced into a valve-seat grinding wheel on an Atlas arbor press at the Sterling Grinding Wheel Co., Tiffin, Ohio. The vitrified wheel is bonded to the insert with an epoxy adhesive compound.

High bond strength and the elimination of insert warping are two of the advantages claimed for the adhesive, which is supplied by the Armstrong Products Co., Warsaw, Ind. This bonding agent comes in two separate packages—one contains the adhesive base of Epon resin, manufactured by the Shell Chemical Corporation, New York City, and the other contains an activator. When mixed in the proper proportion, the adhesive has a pot life of approximately one-half hour. Cemented assemblies are first cured, then aged in a drying oven for two days.

An aluminum insert is shown being forced into center of a vitrified grinding wheel on an arbor press. Excess epoxy adhesive squeezed out during operation is then removed.



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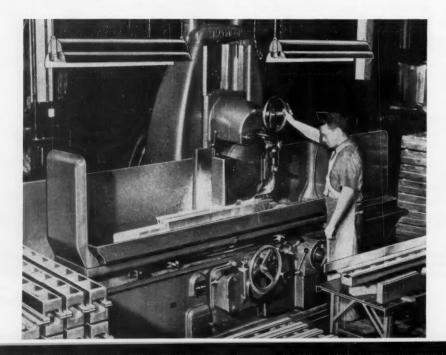


# In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

This Lake Erie 10,000-ton hydraulic sheet-metal forming press, claimed to be the largest in the western hemisphere, produces wing skins for the United States Air Force F-101 Voodoo, at the McDonnell Aircraft Corporation, St. Louis, Mo. The massive jaws of the unit stretch-press a complete wing skin for the twin-jet supersonic fighter—94 square feet of metal—in one operation. Plans call for stretch-pressing all four skins of the Voodoo's thin, swept-back wings.

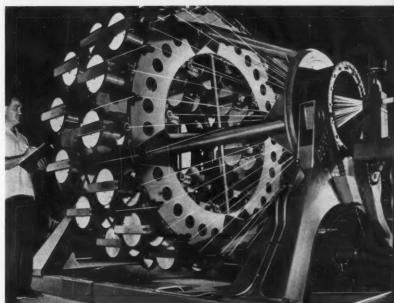
Grinding bedways for small lathes at the Atlas Press Co., Kalamazoo, Mich. Approximately 0.010 inch of metal is being removed from each of eight surfaces at the rate of twelve lathe beds per hour. A tolerance of 0.001 inch is held along the length of the members by this Mattison surface grinding machine. The grinding wheel is kept true by a dressing unit mounted on the wheel-slide.



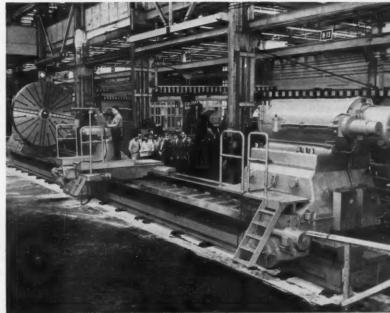
At the Glenn L. Martin Co., Baltimore, Md., the exhaust air from this portable pneumatic router is put to work as a mist lubricant. A fitting attached to the exhaust port connects an oil lubricator with a length of tube running to the cutter. As the router operates, an oil mist is directed at the cutter, lubricating it, and blowing off the chips.



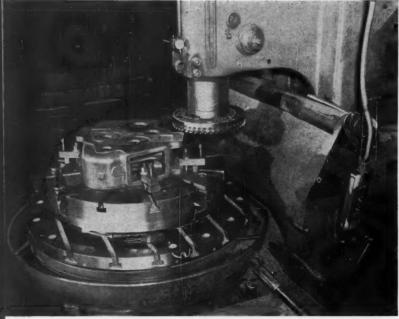
Douglas Roesch, Inc., Los Angeles, Calif., has developed this planetary machine for producing special electronic cable for guided missile, computer, and atomic energy fields. The machine can fabricate intricate cable from delicate strands of conductors, coaxial circuits, quads, and power leads.



Installed in the Large Motor and Generator Department of the General Electric Co., Schenectady, N. Y., this Betts-Bridgeford lathe has a 144-inch swing, 55 feet between centers, and can turn work weighing 200 tons at speeds up to 40 R.P.M. The swing, greatest of any lathe in the company's shop, will permit the design of bigger generators, motors, and other rotating equipment than are now in use.



# Practical Tooling Expedites Milling and Boring Operations

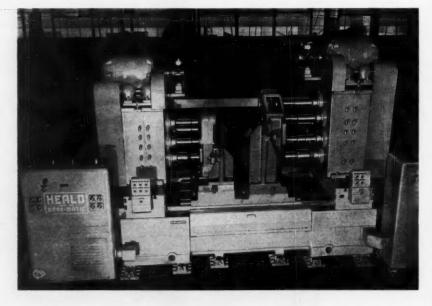


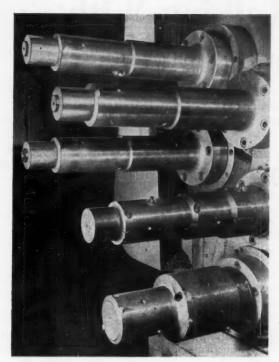
By R. KENNEDY Process Engineer Transmission Division Clark Equipment Co. Jackson, Mich.

CONSTANT changes in the quantities in which products of the Clark Equipment Co., Jackson, Mich., must be turned out require a highly practical approach to manufacturing methods. Costs have to be kept competitive, and it must be possible to amortize both tooling and machines over predictable runs. One aim, of course, is to make all set-ups flexible, yet capable of holding work to close dimensional limits.

This point is illustrated by the milling required on gear-cases for the company's power shovels. Two sizes of this particular part are now in production. The sides of the cases are machined on an Ingersoll rotary milling machine, as seen in the heading illustration. A chuck from a scrapped vertical turret lathe is mounted on the table and serves as a work fixture. By utilizing the feed of the rotary table,

Fig. 1. Special heads on this double-end boring machine complete five holes simultaneously in each gear-case.





both sides of the case are rough and finish machined with an 18-inch face milling cutter.

Holes bored through the sides of the gearcases must be within plus or minus 0.0001 inch on the diameter and plus or minus 0.001 inch on the center distance. A Heald double-end Bore-Matic, Fig. 1, equipped with special heads built

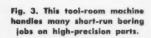
Fig. 2. Floating bushings over the ends of the boring-bars act as vibration dampers.

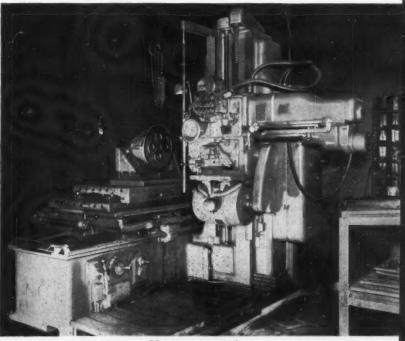
within the Clark plant, handles the two case sizes simultaneously. In Fig. 2 is a close-up view of the boring-bars in one of the heads. Roughing and finishing cutters are set 180 degrees apart in the bars, and have individual micrometer adjusting screws.

To counteract any tendency of the four upper bars to chatter because of their long overhang from the head, each carries at its outer end a loose-fitting steel bushing. Each bushing floats on a pin fixed concentrically in the end of its bar, and serves as a damper. Simple fixtures hold the cases in each half of the machine, and no set-up changes are necessary when different case sizes are placed in work. The castings are air-clamped manually to the fixture, with all boring completed from one side.

The milling of mounting pads on opposite sides of another type of case was simplified by providing a duplex milling machine with a pair of vertical heads. Both pads can now be machined simultaneously from the same set-up.

Another example of practical tooling is shown on the DeVlieg Jigmil seen in Fig. 3. Although this machine is located in the tool-room, it is used extensively for boring low-volume, high-precision parts. In the illustration, a cast-iron converter housing is held in a right-angle fixture mounted on an auxiliary table that can be rotated. Special gaging bars made for each hole to be bored assist in positioning the work.





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# Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

## Success Stories—Key to Increased Sales

In the majority of instances, customers buy new equipment to resolve a production problem. The problem usually can be broken down into several factors, namely, how to improve the quality and utility of the ultimate product; how to economize in power, space, and human energy; and how to reduce waste.

So far, only the basic elements of buying objectives have been stated. There remains one outstanding method, often neglected, that can make sales effort articulate and convince the prospect that the equipment offered him will satisfy. This sales tool is *proof*, based upon what other companies have accomplished from use of the supplier's equipment.

In the field of consumer-goods selling, the public is tiring of meaningless chatter and exaggerated claims. Too often, schemes to attract attention only lead to disgust. With industrial-equipment selling, however, "proof information" is fast becoming the backbone that supports the whole body of creative opinion. If you, as a buyer, agree that you require proof—then you, as a seller, must furnish proof.

There are several ways in which proof information, or success stories, can be collected, disseminated, and put to use in obtaining orders.

First—Plan and execute the gathering of material. The salesman may recognize its value, but since his attention is centered on making day-to-day sales, he neglects to backtrack and dig out pertinent facts concerning the successful use of the product sold. Salesmen ordinarily require help and incentive to uncover all the detailed operating results. Satisfied customers seldom volunteer stories on what the supplier's product has done for them. They are expressive when making a complaint, but are frequently silent when satisfied.

Ordinarily, the information gained should be arranged in the following manner:

Company, location, and date; Application; New operating conditions versus old; Operational time factors involved; Results in terms of increased and improved production;

Advantages obtained;

Economies gained;

Pictures:

Letters from officials (with permission to quote).

Second—Arrange this information in one central file. Index and cross-index according to industry, application, territorial location, and customer. Thus, with success-story information readily available, an approach can be quickly selected to help the sales engineer. Such information can then accompany a quotation or comprehensive proposal.

Third—Publicize the availability of this information throughout the organization so that it can be put to use. Everyone engaged in advertising and sales promotion should avail himself of it. Illustrated stories yield bountiful results.

These stories are excellent material for press notices. They often provide acceptable news-yielding publicity at low cost. In many instances the success stories serve as subjects of interesting papers for industrial and technical journals. In the hands of salesmen there is no other material that equals their value, not only as an attention getter, but also as a convincing sales tool.

Fourth—Train sales engineers in the day-to-day use of success stories. Many sales engineers get into the habit of focusing their attention on the construction and the operating details of the equipment. Although these points are important in eliminating doubts and establishing confidence, no sales argument is completely effective unless proof of satisfactory results from previous installations is offered.

Every sales engineer should be hungry for sales arguments. Success stories on equipment application and use are valuable sales tools for carving out orders. Don't let the collection, classification, and use of these stories become a haphazard task.

# **Grinding Aluminum Segments for**

# Printing Press Cylinders

In the manufacture of a small offset printing press, a highly critical operation involves grinding an aluminum segment which covers about one-third the surface of a large cylinder. Photo-offset metal plates or direct-image paper masters are mounted on the outside of the segment. To get a satisfactory impression with minimum make-ready, the segment must be ground to a close radius (5 1/2 inches), and be perfectly straight for its entire length (17 inches). The press, called a Davidson Dual, is made by the Mergenthaler Linotype Co., Brooklyn, N. Y.

The work is received in the form of a cast drum. Prior to grinding, it is turned on a vertical turnet lathe, then slit into two segments on a milling machine. In Fig. 1, the work is shown as a drum (left), after slitting (center), and after grinding (right).

The grinding operation can be seen in progress in Fig. 2. Equipment consists of a 14-inch Landis cylindrical grinding machine and a 30-by 3- by 12-inch Carborundum wheel. Two segments, fastened to the flanged ends of an arbor, are handled simultaneously. A close-up view from the rear of the machine is shown in the heading illustration.

Approximately 0.020 inch of metal is removed —0.010 inch from each segment—in twelve or



thirteen passes. Checks on straightness after the work has been removed from the arbor show an end to end variation of less than 0.001 inch. Production is at a rate of six segments per hour.

The company claims that the close dimensional

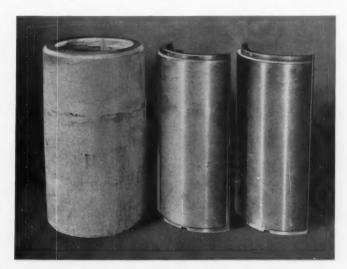


Fig. 1. The work arrives as a cast drum (left), is turned and slit into two segments (center), and then ground on its convex surface (right).

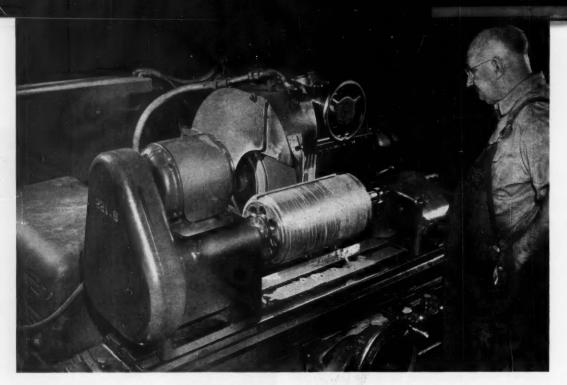


Fig. 2. The aluminum segments for the printing press cylinders are mounted on an arbor and ground two at a time.

Fig. 3. Here, the coolant is an expendable spray, and proves to be a practical means of size control."



control and good surface finish obtained on the aluminum segments are largely the result of a good combination of abrasive and coolant—a medium-grain, silicon-carbide, vitrified-bonded wheel (C-36-I-4-VE) and a 1 to 15 mixture of International Compound No. 131-A.

This coolant is also successfully applied as a spray in the preparatory vertical turret lathe operation on the drums. In Fig. 3, the spray can be seen as it impinges on a drum during the turning of the outside diameter.

### Fiber-Metal Technique Developed that Promises Wide Application

A metallurgical technique which may lead to an entirely new use of metals has been developed at the Armour Research Foundation of the Illinois Institute of Technology, Chicago, Ill. The technique, known as fiber metallurgy, is unique because it uses a bulk starting form of metal heretofore not employed-short metal fibers. It is possible to make products having a wide range of porosities combined with relatively high strength and toughness. Among the potential uses for fiber metal are filter materials and skeletons to support plastics, ceramics, and friction materials. Many operations in fiber metallurgy are the same as in powder metallurgy. The properties of fiber-metal bodies can be adjusted by controlling the methods of manufacture.

### **INGENIOUS**

# Mechanisms selected

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

### **Piloted Feed Control Mechanism**

By JEAN SIRIEX, Paris, France

Auxiliary tooling for a copying lathe may be carried on an automatic overhead slide. A hydraulically operated mechanism for the independent control of the vertical feed of the slide is shown in the accompanying illustrations.

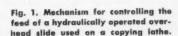
Three basic units comprise the complete feed mechanism: a high-pressure hydraulic system to provide the necessary thrust for rapid approach, working feed, and rapid withdrawal; a lightly loaded mechanical unit to insure precise feed control; and an electrical system to afford positive control over the entire device. Pressure in the hydraulic system is built up by a motor-driven pump that is mounted in a support, forming the hydraulic reservoir, located beneath the lathe headstock. Fluid under pressure enters the slide through line A, Fig. 1, and returns to the reservoir through line B. Fluid flow from these lines to the slide is controlled by a double-acting control valve C.

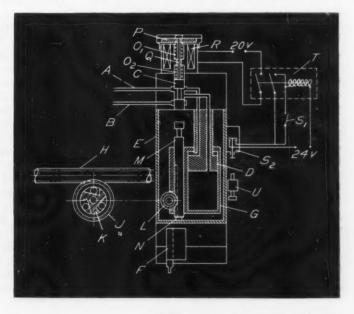
Differential piston D is attached to moving

slide E so that tool-holder F and the piston will move in unison. Cylinder block G, in which the piston rides, is part of the fixed portion of the slide unit.

Pilot lead-screw H, the restrictive component of the feed control unit, is driven from the lathe spindle through a separate gear-box, providing it with a selection of eleven feeds. Located within the slide support, and meshing with the lead-screw, is tangential gear J. This gear fits over a roller type clutch-wheel K. As the lead-screw rotates gear J in a clockwise direction, the rollers in the clutch disengage, providing a free-wheeling condition. It should be noted that the gear and clutch assembly is shown outside of the slide unit for clarity only.

Pinion L, mounted on the same shaft as clutch-wheel K, meshes with vertical rack M. The rack is situated along the same axis as is control valve C. When the rack is forced downward, pinion L rotates. As a result, the clutch-wheel rotates in





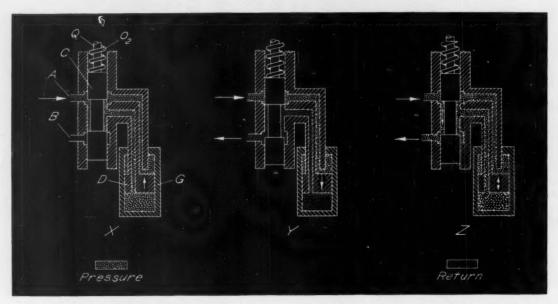


Fig. 2. Positioning of valve (C) results in either of three movements—rapid approach, rapid withdrawal, or working feed.

the same direction as, but faster than, gear J. This causes the clutch rollers to engage, thus restricting the speed of the descending rack to the selected speed of lead-screw H as long as pressure is maintained on the rack. The lower end of the rack is positioned by stop N which is solid with slide E.

When the unit is inactive, spring  $O_1$  forces plate P, which is free to slide on headed valvestem Q, against the cover of solenoid R. This holds the control valve in a raised position so that the feed-back orifice is closed as shown at X in Fig. 2. In this position the hydraulic fluid under pressure is channeled to both the small chamber above the piston and to the large chamber below the piston. Although the pressures in both chambers are equal, a larger piston-face area is exposed in the lower chamber so that the total force pushing upward is approximately twice that pushing downward. Therefore, the piston, together with the slide, is maintained in a raised position.

With the machine in operation, movement of the overhead slide is initiated either by rotation of the template carrier or by the arrival of the lathe saddle at a chosen longitudinal position. Upon the closing of switch  $S_1$ , relay T is closed, and remains so even when the switch reopens. This energizes solenoid R which attracts plate P to it, compressing spring  $O_1$  and releasing the valve-stem.

Under the influence of spring  $O_z$ , the control valve is now forced downward to its lowest position as shown at Y, closing the connecting passage between the two cylinder chambers and

opening the return line to the reservoir. Oil delivered by the pump is now directed only to the small chamber above the piston. The piston is thus forced downward imparting a rapid approach to the cutting tool as, at the same time, the oil leaves the large chamber below the piston and flows into return line B.

During ascent of the piston, or rapid with-drawal of the cutting tool, the control valve is in the same position as it is when the unit is inactive. This is the raised position that may be seen by referring back to X, in which the connecting passage between the two cylinder chambers is opened, and the feed-back orifice is blocked. The pressure in each being equal, the greater total force exerted against the large bottom face of the piston forces it to rise at maximum speed. Oil being delivered by the pump joins the oil leaving the upper cylinder chamber and flows into the lower cylinder chamber.

The equilibrium position, or the position assumed by the control valve while the cutting tool is being fed into the work-piece, is illustrated at Z. This position is effected when the slide descends rapidly until the bottom of the control valve contacts the top of rack M. The rack is then forced downward, rotating pinion L and causing clutch-wheel K to rotate in the direction shown. The rotative speed of the clutch-wheel results in its engagement with gear J. Rapid downward movement of the rack is thus checked, it being able to descend only as fast as lead-screw H, through gear J, will permit. This speed is selected by the lathe operator.

As the speed of the rack is reduced, the control

valve is pushed upward allowing the feed-back orifice to close. The hydraulic fluid, being now diverted to both sides of the piston, forces the slide in the opposite direction. Because spring  $O_2$  constantly tends to push the control valve downward to effect a rapid approach, a series of valve movements occur until the opposing pressures on the piston are stabilized.

In this position, oil enters the upper annular portion of the valve housing and passes immediately to the small chamber. The valve is positioned so as to leave a bleed opening in each of the two annular spaces. Oil bleeds through the first opening to the lower cylinder chamber causing the cutting tool to raise slightly. The oil then bleeds through the second opening and returns

to the reservoir, causing the cutting tool to lower slightly. All excess oil supplied by the hydraulic pump by-passes the valve and returns to the reservoir.

At the end of the cutting stroke, microswitch  $S_2$  is actuated by adjustable stop U. When the circuit is broken at this point, relay T is opened with the result that solenoid R is de-energized. Control valve C is pulled upward by the action of spring  $O_1$  against plate P, and a rapid withdrawal is effected. As the slide is raised, it forces the rack to travel with it. The unit is held in this raised position until again activated. If necessary, the solenoid cover can be adjusted to limit valve displacement, thereby varying the speed of withdrawal.

### **Reciprocating Drive Functions Around Roller Chain**

By ROBERT B. OGDEN, Shortsville, N. Y.

During the development of a new product, the need arose for a simple reciprocating drive capable of operating under loads approaching the heavy-duty mark. A stroke of 24 inches in length was required, but machine appearance and space considerations ruled out the use of conventional crank and lever type drives.

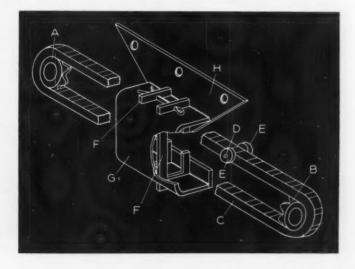
To meet these conditions, the illustrated sprocket and roller chain drive was developed. Either one of the two sprockets A or B can be used as the driving member, the remaining sprocket serving as an adjustable idler. Roller chain C is of standard design with one exception, one of the link rivets has been replaced by a long pin D. On each end of this pin is a roller E, held in place by cotter-pins.

In operation, the rollers are located between two follower-plates F, and also drive against

them. The followers fit closely within slots in housing G and are held in place by cotter-pins on both the top and bottom. A gap is cut in one leg of the follower-plates to provide clearance over the sprocket hubs when the housing is at either end of the stroke. Bracket H is welded to housing G and bolted to the machine slide to be reciprocated (not shown).

As the roller chain moves with the two rollers E, located between the follower-plates, linear motion is imparted to the housing and then to the machine slide. When the chain link supporting the rollers reaches one of the sprockets, it descends, changing direction and returning on the lower span of the chain. Remaining between the two followers, the rollers now drive the housing and the machine slide in the opposite direction, providing the desired reciprocating motion.

Roller chain imparts reciprocating driving motion to machine slide (not shown). Rollers (E) engage follower-plates (F), which carry slide bracket (H) with them in both directions of travel.



## TOOL ENGINEERING

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

### Multiple Holder Permits Independent Tool Adjustment

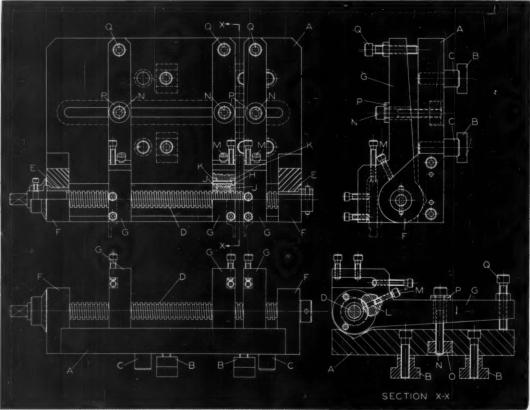
By Francis R. Terrell, Leicestershire, England

At one station of a multiple-spindle automatic screw machine producing armature shafts for an electric motor, it was necessary to take several necking cuts simultaneously. On the armature for another model electric motor, similar cuts were to be made, the only difference being the spacing between cuts. A multiple holder with independently adjustable tool carriers was designed to facilitate operations on both shafts.

Base A of the tool-holder is a steel plate fitted with four T-nuts B and four ground locating

pins C for positioning on the machine slide. In the upper face of the base is a ground V-groove. Above this groove, and in line with it, is a lead-screw D into which has been cut a square thread. The lead-screw is supported at either end by bronze bushings E pressed into end brackets F. A collar and taper pin lock the right-hand end of the lead-screw, while a calibrated dial, provided to facilitate backlash removal, secures the opposite end.

Although three tool-holders G are being used



Multiple holder features independent adjustment of each tool carrier from a single lead-screw.

in the particular case illustrated, the unit can be designed to include any practical number. Regardless of the number of tool-holders employed, each one is provided with a nut H that is cut with a square thread to engage the lead-screw. These threads are a little deeper than the standard square thread so as to provide a certain amount of lateral play. On each side of the nut is a race of ball bearings J held in place by hardened steel plates K. A small binding-pin L, section X-X, is forced into a groove machined around the periphery of the nut to prevent its rotation. The pin is urged forward by screw M.

Each tool-holder is secured in position by an individual lock-screw N. This screw passes through an elongated hole in the tool-holder, then through a slot in the base, and is finally threaded into a block O that fits into the recessed portion of the slot. A spherical washer P is placed beneath the head of the lock-screw to insure full seating regardless of the angle assumed by the tool-holder.

The lower, forward end of the tool-holder, which is rounded in shape, lines up with the V-groove in the base. Therefore, adjustment of cap-screw Q causes the holder to rock, thus compensating for any tool wear that might cause the cutting edge to fall below the work-piece center line.

Adjustment of any one of the tool-holders independently, or all of them simultaneously, can be accomplished easily. To do this, cap-screw M of the tool-holder in question is tightened. Binding-pin L is thus forced forward into contact with nut H, preventing the nut from rotating. When lead-screw D is actuated, the nut and tool-holder, acting as a single unit, will follow it to either the right or left, depending on the direction of screw rotation. After the desired setting has been reached, cap-screw M is backed off, releasing the binding-pin. Any further movement of the lead-screw will merely result in nut H rotating freely between bearings J, with no further movement of the tool-holder.

### **Comparator for Checking Tapers**

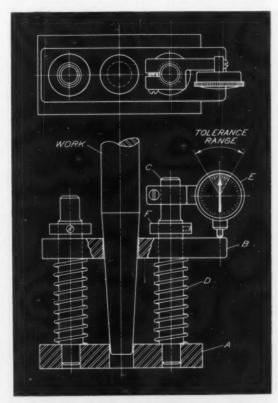
By H. J. GERBER, Stillwater, Okla.

Production checking of tapers can be speeded with the comparator illustrated. The device, which measures the change in diameter of the taper in a given axial distance, is easily made and quick and simple in operation. It is superior to a sleeve gage, in that no bluing is required.

The comparator consists of a baseplate A, bridge-piece B, a pair of posts C and springs D, and a dial indicator E. The posts, joining the baseplate and the bridge-piece, are a press fit with the baseplate and a sliding fit with the bridge-piece. The springs enclose the posts, keeping the bridge-piece in normal contact with stop collars F.

One end of the bridge-piece is somewhat longer, forming an anvil for the indicator, which is strapped to the top of one of the posts. Both the baseplate and the bridge-piece are bored cylindrically, each to a size corresponding to the known diameter of the required taper at a point along its axis.

In operation, a tapered master is inserted in the bridge-piece, which is depressed until the end of the master makes contact with the base-plate. With the bridge-piece still depressed, the indicator is adjusted to read zero. Work-pieces are then substituted for the master, to which they are compared by observing the indicator. Acceptable tapers will return the indicator to a tolerance range that can be established on either side of the zero reading.

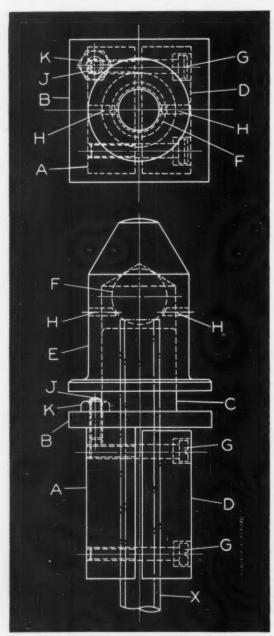


The taper is acceptable if the indicator reads in the tolerance range.

### Simple Fixture for Producing Spherical Flares on Tube Ends

By W. M. HALLIDAY, Southport, England

A simple fixture designed to make spherical flares on a limited number of aluminum tubes is here illustrated. The fixture controls both the shape and size of the flares.



The main body of the fixture consists of a rectangular steel block A having an enlarged square shoulder B and an integral cylindrical stem C. With a rectangular steel block D in place, the stem and blocks A and D are bored to a diameter from 0.003 to 0.005 inch greater than the outside diameter of the tube X that is to be inserted for flaring.

In use, the fixture is placed in the jaws of a vise with shoulder B resting on top of the vise jaws. The tube to be flared is passed between blocks A and D and through stem C. Sliding block D clamps the tube X to block A when the vise jaws are tightened. A hollow cap E is then slipped over stem C until a steel ball F contacts the end of the tube. Hammering on the hardened, rounded dome of this cap forces the ball into the tube and produces a flared end.

Block D is attached to member A by four fillister-head screws G, and is permitted about 3/16 inch of sliding movement on the screws. The inside edges of both blocks provide a 1/8-inch wide gap when screws G are tightened to retain the tube in flaring position.

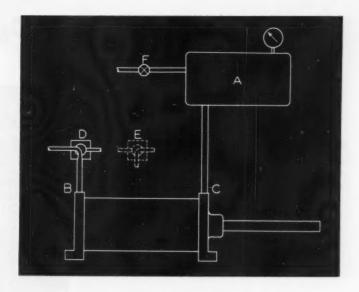
Ball F is seated in a conical recess in the cap and is retained loosely by two pins H. The pins are slightly tapered to provide a bearing surface. About 0.020 inch endwise movement of the ball should be allowed. To permit the cap to have the adequate amount of sliding movement necessary to form the required flare, the distance from the upper end of the stem to the pin locations should be carefully determined.

The sliding movement of cap E is regulated to a certain extent by a headless stop-screw J, mounted in a tapped hole in shoulder B. Lock-nut K locates the screw at a pre-determined height. The setting of this stop-screw J insures that all flares will be formed to the same size. Adjustment of the screw allows the size of flare to be varied as desired.

The same type of fixture may be used to produce conically flared ends on tubes. This may be accomplished by replacing the steel ball with a conically shaped steel plug that is machined to the required angularity.

Vise fixture produces accurate spherical flares on the ends of light alloy tubes.

An accumulator tank that reduces air consumption by providing low-pressure air in place of highly compressed air for the return piston stroke.



### **Accumulator Reduces Cylinder Air Consumption**

By CLIFFORD MOLLOY, Bronx, N. Y.

Air cylinders are widely used in shops for clamping, punching, staking, and other operations requiring sustained pressure or percussion. Compressed air requirements for cylinders used in such applications can be reduced substantially by the use of accumulators. In conventional air cylinders, not equipped with springs for returning pistons, high-pressure air is used for both forward and reverse strokes.

To reduce the consumption of compressed air, an accumulator A can be connected to the cylinder, as shown in the accompanying schematic drawing, to permit low-pressure air to be used for the return stroke. On the forward stroke air at 60 to 120 pounds per square inch is admitted into the cylinder at the back end B to drive the piston forward. Simultaneously, the piston forces the air out of the front end of the cylinder at C and into the accumulator.

When the air supply to the back end of the cylinder is cut off, valve D is adjusted to position E, permitting the air captured in the cylinder to exhaust into space. The piston is then forced to the rear of the cylinder by air at 10 to 15 pounds pressure per square inch which flows from the accumulator tank.

Shop air charges the accumulator to the pressure necessary to return the piston. Air is admitted to the tank until the pressure reaches a point that insures good results. When supplying this initial charge, valve F is open.

The operation of the cylinder can be controlled by hand- or foot-operated valves or by electrically controlled valves. If used with a single air cylinder, the accumulator should have a volume at least five times that of the cylinder. When used with more than one cylinder, the volume of the accumulator should be at least five times the total volume of all cylinders, provided the pistons move simultaneously in the same direction. The tank can be smaller if the pistons operate out of phase with one another.

#### **New Techniques for Titanium Extrusion**

Experiments with new titanium fabricating techniques, conducted for the United States Air Forces, are described in a recent report. Research on the extrusion process, which was carried on by the Battelle Memorial Institute, Columbus, Ohio, indicated that the use of conical dies, rather than flat dies, in the extrusion of round titanium bars, results in improvement of both metal flow and surface finish. The optimum die angle was found to be about 130 degrees. Optimum mechanical properties were attained at extrusion temperatures in the alpha-phase region for unalloyed titanium, and in the alphabeta region for titanium alloys such as Ti-3Mn. Lubricants containing graphite, molybdenum disulfide, and mica proved acceptable.

The 77-page research report (PB111696), entitled "The Extrusion of Titanium," is available at the price of \$2.00 from the Office of Technical Services, United States Department of Commerce, Washington 25, D. C.

# Ideas for Shop and Drafting-Room

#### Circle Scriber for Lathe Tailstock

By JOHN HOMEWOOD, Burbank, Calif.

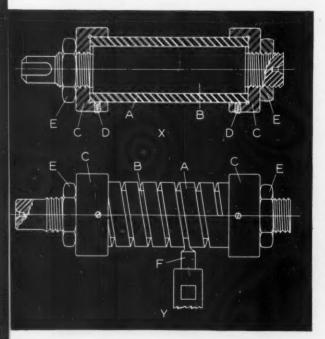
A useful gadget for scribing bolt circles on flanges while they are still chucked on a lathe is shown in the accompanying sketch. The device consists of a tapered shank fitting the tailstock and a square member which can slide in a head integral with the shank. At its end, the square member has a sharply pointed cutter which serves as a scriber. To facilitate setting the cutter, the member has 1/16-inch graduations.

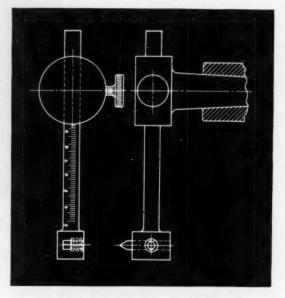
### **Helical Spring Cut from Tubing**

By H. J. GERBER, Stillwater, Okla.

When constructing special tools or machinery, the need for one or two heavy-duty helical compression springs, of a non-standard size, frequently arises. Springs of this type can be produced on a lathe with the simple set-up illustrated.

The material from which the spring is to be cut should preferably be tubing of the desired hardenable grade of steel. In the absence of





Scriber which can be used for laying out a flange bolt circle while still on a lathe

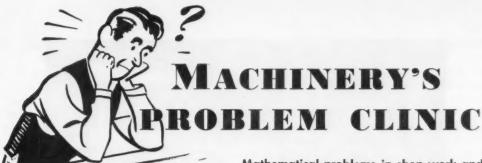
tubing, solid bar stock may be bored to the proper wall thickness.

The tubing A is slipped over a soft steel mandrel B that has been threaded at both ends. Retaining caps C, which are screwed on the mandrel, slip over the ends of the tubing. These caps are provided with set-screws D to prevent any possible rotation of the tubing on the mandrel during machining. Lock-nuts E retain the caps in position. The assembled unit is placed between lathe centers, and a driving dog is clamped on its left-hand end.

A parting tool *F*, ground to the desired helix angle, is used to groove the tubing. The cut extends through the work to the periphery of the mandrel. Each end of the spring is then squared off by feeding the cutting tool part way through the work-piece.

Heat-treating to the required spring temper follows. If the mandrel is not going to be reused, it can serve as a hardening fixture to prevent distortion of the spring. After hardening, the ends that were partially cut through can be broken off, and the spring ends finished by grinding square.

A heavy-duty helical spring may be cut from steel tubing while supported on a soft steel mandrel.



Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

### Calculating Locating Dimensions for a Tube-Bending Fixture and an Assembly Drill Jig

By JAY N. EDMONDSON, Professor, Industrial Engineering, Ohio State University

Clearances dictated by the product design (aircraft) required that the tube seen in Fig. 1 be bent on 6-inch radii as indicated and pinned to couplings separated by 14.82 inches. Dimension X was needed for the design of the bending fixture, and also for the assembly drill jig (for two couplings and one tube).

Solution:

Before length X can be calculated, it is necessary to determine dimensions D and E and angle  $\theta$ , which are shown in Fig. 2.

1. D = R + y= R + (R - C) = 2R - C= 12 - 4.62 = 7.38 inches

2.  $\cos \Theta = \frac{D}{2R} = \frac{7.38}{12} = 0.615$ ,

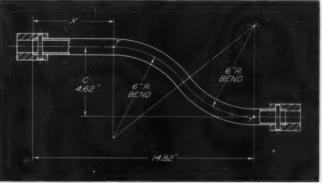
and from a table of trigonometric functions,

 $\Theta = 52$  degrees 3 minutes

3.  $E = 2R \times \sin \Theta$  $= 12 \times 0.78855 = 9.46 \text{ inches}$ 

4. X = A - E = 14.82 - 9.46 = 5.36 inches

Fig. 1. (Right) After the tube has been bent to the 6-inch radii shown, it is placed in an assembly drill jig, where fastening-pin holes are drilled through the couplings and the tube.



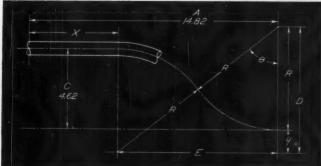
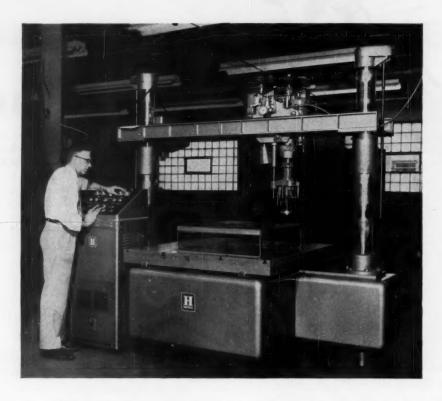


Fig. 2. (Left) Dimension X is computed from dimensions (D), (E), and angle (0), which are determined from the specifications given in Fig. 1.



# **Drilling Control Panels** at the Turn of a Dial

DRILLING of various size holes in industrial control panels is a time-consuming operation. The controls and instruments which are mounted on such panels require virtually unlimited combinations of mounting-hole spacings and locations, as well as a wide range of hole diameters. Control panels are usually made from 1/8-inch thick steel, although 1/2-inch thick Masonite is finding wider application where great strength is not required.

The conventional process of manually laying out, checking, center-punching, and drilling holes requires an average time of about five minutes per hole. Even though the required tolerances in the hole location are not critical, the process is subject to human error. In order to substantially reduce the average time per hole and at the same time decrease the possibility of human error, engineers of the Machine Controls Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., have designed the automatic drilling machine seen in the heading illustration. Using a special machine built by Farwell Metal Fabricating Co., St. Paul, Minn., they have

added automatic controls which enable an operator to dial the X and Y co-ordinates of a desired hole location and perform the drilling operation by merely pressing a button.

Compared to some of the most advanced examples of numerical control of machine tools, the Honeywell drilling machine is really only semi-automatic since it still requires the full attention of an operator. The machine typifies the large portion of the field of machine control wherein fully automatic numerical control is neither economically justifiable nor truly necessary. In this case, for example, control through punched cards or tape could readily have been provided. However, the added expense would not have improved the machine's productivity to any great extent, since the production of such panels is highly customized and repeat orders for a specific configuration are relatively rare.

The machine consists basically of a traveling drill head mounted above a movable table. Both table and head can travel a distance of 4 feet in perpendicular directions so that any point in a 4 by 4 foot area can be machined. Larger panels (8 to 10 feet long and up to 6 feet in width as limited by the throat of the machine) can be drilled in several steps. The drill spindle travel of 4 inches is adequate for all drilling operations, while the entire head and cross-rail assembly can be raised or lowered to accommodate various heights of panels.

The drill spindle is driven by a thyratroncontrolled variable-speed motor to provide optimum spindle speeds for drills as small as 1/32 inch in diameter. In addition, a belt reduction makes it possible to saw or fly-cut large holes up to 6 inches in diameter at speeds as low as 3 R.P.M. The drill head is equipped with a multiple-spindle attachment to allow as many as five holes to be drilled simultaneously. The clearance hole and mounting holes for a pressure gage, for example, can be machined in one pass by attaching a hole saw in the center spindle and as many small drills as required in the four adjustable spindles. This feature is particularly useful when several identical components are to be mounted on a panel.

Both the drill head and table are positioned anywhere over their 4 feet of travel by positional servomechanisms comprising thyratron amplifiers, alternating-current servo motors, and feedback potentiometers. Inputs to the two servo loops are taken from resistive voltage dividers which allow voltages corresponding to distances of from 0 to 48 inches, expressed to the nearest thousandth of an inch, to be selected on a group of selector knobs.

The two direct-current input voltages are compared with their respective feed-back voltages, converted to 60-cycle alternating-current signals, and fed into two relay amplifiers. These relay amplifiers are used to set the allowable error limits and determine when the servo systems have been positioned within the required tolerance. The error signals are also channeled to the thyratron power amplifiers, added to their respective tachometer feed-back signals, and used to control the bias on the thyratron grids.

Additional controls on the console, Fig. 1, provide for jogging of all machine motions, control of spindle speed, sequence control of drilling operations, and choice of constant feed or constant thrust drilling. Reset controls are also provided to return the head and work-piece to a location convenient to the operator following single operations. Indicator lights showing the position of the head and table relative to the called-for position allow the operator to determine the loca-

Fig. 1. Control console of special drilling machine seen in the heading illustration. Large holes in panel are cut with hole saw shown, while smaller holes are produced with twist drills. tion of any reference point on the work-piece with respect to machine co-ordinates.

With this arrangement the operator is not required to locate the panel accurately on the table, but he can determine where he has placed the panel in terms of the machine's co-ordinate system. To do this he jogs the head and table until the spindle is aligned with some reference point on the panel, and adjusts the input selectors until the indicator lights show that the desired positions coincide with the existing positions. By correcting all co-ordinate instructions by the amount of these initial settings he can proceed with the drilling process without the need for alignment of the panel.

Inherent positional accuracy of the measuring system is not high enough to insure adequate accuracy of final hole location, since errors are present in the lead-screws, feed-back potentiometers, and associated gearing. In order to insure the desired over-all accuracy the positioning systems were calibrated against accurate length bars and the input voltage dividers adjusted to compensate for major non-linearity errors. The resulting positioning accuracy is within the desired 0.005 inch and repetitive accuracy is approximately half of this.



MACHINERY, February, 1956-205

# LATEST DEVELOPMENTS IN



### Ex-Cell-O Special Machine for Rapid Processing of Automotive Crankshafts

Three operations are performed simultaneously on two automotive crankshafts by a special machine built by the Ex-Cell-O Corporation, Detroit, Mich. Already in operation, this machine is said to be consistently reducing production costs. It is loaded and unloaded automatically and is arranged to receive and discharge work-pieces by conveyors, resulting in less handling and accelerated output.

Operations on the crankshafts include finish-boring a diameter within limits of plus or minus 0.0005 inch and holding the bore concentric with the main bearings, facing a surface square with

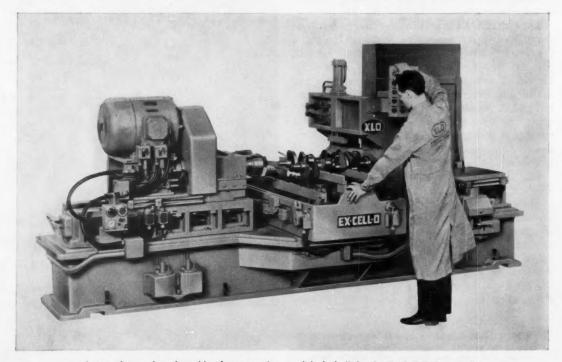
the main bearings, and chamfering an edge. The machine uses two standard Ex-Cell-O hydraulic slides mounted on a base with a fixture between them. At the beginning of each successive machine cycle, two crankshafts have been completed in the machining station while a second pair are in the "ready" position.

Transfer bars move the finished crankshafts to an unloading device, while the unfinished crankshafts are brought into the machining position. Hydraulic chucks grip the latter shafts and rotation begins. Non-rotating tools advance horizontally to

finish-bore the ends of the rotating shafts. This done, facing and chamfering tools descend from above the work and complete the machining cycle.

Aside from its efficient functioning, this special machine illustrates another concept of modern production methods, namely, the application of automation in departments remote from a main production or automation line. These smaller installations, serving as feeders of finished or semifinished parts to the main line, are often adaptable to such space as is available.

Circle Item 101 on postcard, page 245

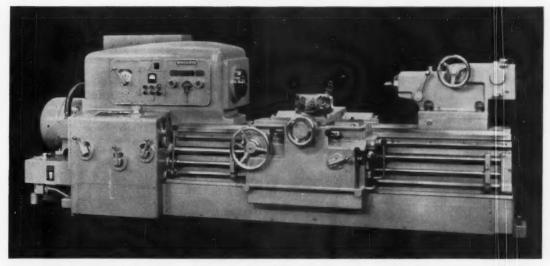


Automation-equipped machine for processing crankshafts built by the Ex-Cell-O Corporation

## Equipment Machine tools, unit mechanis material handling appliances of

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON



Heavy-duty Dyna-Shift lathe built by the Monarch Machine Tool Co.

#### Monarch Heavy-Duty "Dyna-Shift" Lathe

A Series 80 heavy-duty engine lathe, designed for rapid and accurate turning, boring, and facing of large-size work-pieces, is being introduced by the Monarch Machine Tool Co., Sidney, Ohio. This machine will be available in four models, each equipped with a "Dyna-Shift" headstock. Automatic calculation of spindle speed to produce the desired surface cutting speed on the work-piece is a feature of this machine. Thirty-six different speeds, ranging from 8 to 1000 R.P.M. in Models 2000 and 2001 and from 10 to 1250 R.P.M. in Models 1600 and 1601. are available to satisfy a wide variety of different job requirements.

The Dyna-Shift headstock has two large dials. One dial can be set to the work diameter to be turned, and the other to the desired surface cutting speed. When these dial adjustments are made and the Dyna-Shift control lever is moved to the "Shift" position, the headstock automatically and hydraulically shifts gears to give the exact spindle speed necessary to produce the desired surface cutting speed. The control lever can also be set for "Free" and "Run" positions. The "Free" position allows the operator to rotate the spindle easily by hand, while the "Run" position enables the spindle to be started under power by depressing either of the dual work start-and-stop levers, installed at the apron and headstock end of the machine. "Jogging" of the spindle is accomplished by raising the start-and-stop levers. Interlocks in the headstock mechanism prevent incorrect operation of the controls.

All electrical controls are located at the front of the headstock. They include the main drive motor forward and reverse pushbuttons with signal lights to show direction of motor rotation; control push-buttons for accessory equipment, such as the coolant pump and "Air Gage Tracer"; a horsepower meter which indicates the amount of motor drive power being utilized; and a manual lead-screw reverse control lever.

Lubrication of all headstock gears and bearings is by means of a high-pressure mist and spray type system. Manifold hydraulic circuits eliminate exterior tubing. The gear-box provides for the changes required to cut forty-eight commonly used threads. The threading range is from 1/2 to 28 threads per inch, including 11 1/2 threads per inch, Feeds range from 0.003 to 0.168 inch per revolution of the spindle.

The apron is equipped with four-way, hydraulic power, rapid traverse, which permits movement of the carriage to the right or left and movement of the crossslide in or out. The controls are

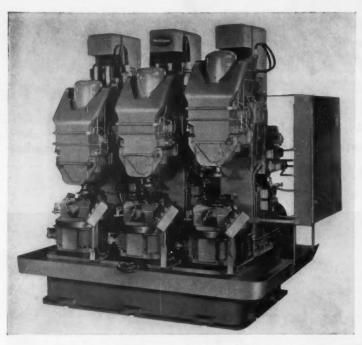


Fig. 1. Michigan three-column triple-head milling machine

arranged so that any one of these movements may be made separately or in a combination of one carriage and one cross-slide movement at the same time. A variable-speed control feature of the power rapid traverse eliminates the need for manual turning of handwheels, even for close positioning.

A full range of accessory equipment is available for these lathes, including the Monarch "Air Gage Tracer" for accurate turning of multiple-diameter shafts and the turning, boring, and facing of contours. The four models are designed to provide clearance diameters of 25, 30, 32, and 36 inches, respectively. All models are available in standard lengths ranging from 48 to 240 inches between centers. Each model is equipped with a 45-H.P. main drive motor.

#### Special Three-Column Triple-Head Milling Machine

The Michigan Drill Head Co., Detroit, Mich., has announced a special three-column, triple-head milling machine for finish-milling the three slotted lugs on an automotive clutch ring. Three standard hydro No. 3 vertical feed units mounted on a single base and three 20-inch hydraulic indextables, with three work-stations on each head, are incorporated in this machine. Each hydro unit is equipped with a horizontal cutting tool, and the cycle of each indextable is arranged to mill, in turn, each of the three lugs on the clutch ring

With this equipment, it is possible to finish-mill all three slotted lugs—keeping the finished surface in the same plane—with exceptional accuracy because all milling on a single clutch ring is done by

the same horizontal cutting tool. The new machine is completely automatic, except for loading and unloading, and is designed for one-man operation. It is synchro-

nized so that, when one head is idle, the other two continue operating, permitting the operator to unload and reload each head in successive steps. Production is at the rate of 360 clutch rings per hour.

The machine is built to J.I.C. hydraulic and electrical standards and has automatic lubrication throughout. Hydraulic power clamping of the clutch rings is performed automatically. The whole operation is controlled by a cycle switch.

Circle Item 103 on postcard, page 245

#### Adjustable-Speed Drive

The Reliance Electric & Engineering Co., Cleveland, Ohio, has announced an adjustable-speed drive for machine tool feeds, designated the "VS-100 Drive." This drive affords a speed range ratio of 100 to 1 with continuous electrical speed adjustment which has a high degree of stability over the entire speed range. The drive has a capacity range of from 1/2 to 4 H.P. It can be applied to machines that require continuous adjustment over a 100 to 1 speed ratio range and to those which provide even higher speed ranges through simple gear-shifting or ratio-changing devices.

These complete "packaged" drives have electronic control panels that are suitable for mounting and integrating with other machine controls. The motors are specifically designed for operation from the electronic control units. Reliance Sealpak construction is a feature of the control panels whereby all of the small electronic components are grouped, wired, and sealed in plastic for complete protection from harmful atmospheres, vibration, and shock.

For special feed requirements,

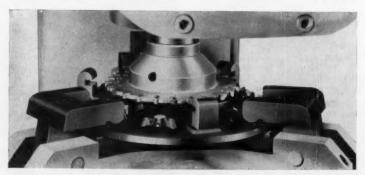


Fig. 2. Close-up of work and cutter at one of the three columns of machine shown in Fig. 1

the drive can be modified to provide extremely close speed regulation by tachometer feed-back. The addition of an amplifying section, on a "building block" basis, converts the basic panel to a precision regulator.

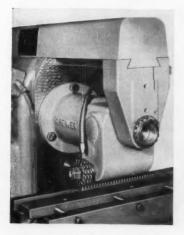
Circle Item 104 on postcard, page 245

#### Rack-Milling Attachment for Greaves Horizontal Milling Machine

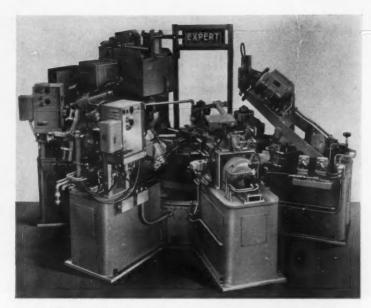
Many types of cross-milling operations, including the milling of racks on long work-pieces, are made possible on the horizontal milling machine manufactured by the Greaves Machine Tool Division, J. A. Fay & Egan Co., Cincinnati, Ohio, by the use of a rackmilling attachment recently introduced. The new unit consists of a milling head which can be mounted on the column face of the machine. The axis about which the cutter revolves is at an angle of 90 degrees to that of the machine's horizontal spindle. Additional support is provided by the over-arm and arbor support.

The attachment is driven directly from the machine spindle through spiral bevel gears. Spindle speeds are in a 1 to 1 ratio with the machine spindle speeds. The attachment is supplied complete with a special rack vise 36 inches long having a jaw opening of 5 1/2 inches. Racks of greater length can be milled by simply moving the work-piece in the vise. Shorter pieces can be mounted together in the vise for fast production.

Circle Item 105 on postcard, page 245



Greaves rack-milling attachment



Six-station, automated indexing machine for assembling, welding, and brushing operations, built by the Expert Welding Machine Co.

#### Six-Station Automatic Machine for Processing and Assembling Gear and Hub

An automated, six-station index machine that presses, induction-preheats, spot welds, wire brushes, and automatically unloads an internal gear and stamped hub assembly at the rate of 260 assemblies per hour, has been built by the Expert Welding Machine Co., Detroit, Mich. An outstanding feature of this machine is the automated fixture arrangement. The complete machine is about 11 feet in diameter and 8 feet high.

The parts to be assembled, consisting of the hardened steel gear 5 inches in diameter and the previously welded stamped-steel flange and machined-hub assembly, are manually loaded into the fixture at the first station. The machine table is then indexed to the second station where the parts are pressed together and induction-preheated to 500 degrees F. The pressing operation is accomplished by a hydraulic press which is counterbalanced and can float up and down to accommodate the fixture without deflecting the indexing table. At the pressing station, the parts are air-chucked, pressed, and held together while an induction coil heats them for four and one-half seconds.

As the part is indexed to the third station, the fixture is tilted to a 45-degree position for the

argon shielded spot-welding operation. At this station a flanged head in the base unit moves forward and engages the fixture face with four radial rollers. This locks the work in the correct radial position for the welding operation. The power-drive jaw clutches also are engaged at this time. During the welding operation, three running spot-welds are produced at 120-degree locations. Unique drive controls rotate the part assembly at the rate of 60 inches per minute for the three welding operations and at 170 inches per minute between welds.

At the fourth station, a second set of running spot-welds are similarly arc-welded at 120-degree locations, correctly spaced between the former welds.

As the assembly is indexed to the fifth station, the fixture is tilted back to the vertical position for the wire-brushing operation. At this station, an air-cylindercontrolled, motor-driven wire brush is lowered to engage the weld portion. During brushing, the part is rotated to remove any excess weld splatter.

At the sixth and final station, the fixture is kept in its vertical position and an air-cylinder-controlled mechanical hand removes the finish-welded assembly.

Circle Item 106 on postcard, page 245



Link type underdrive press built by the E. W. Bliss Co.

#### Bliss Link Type Underdrive Press of Improved Design

An improved link type underdrive press designed to eliminate sticking or stalling at the bottom center of its stroke has been announced by the E. W. Bliss Co., Canton, Ohio. Although difficulties from sticking have never been encountered in Bliss overdrive presses, the new underdrive design is more susceptible to sticking because of the long pull-down rods of the latter type machine. To prevent trouble from sticking, the mechanism of the new underdrive press has been so designed that the rockshaft still lacks a few degrees of reaching its bottom dead-center position when the slide is closed and maximum force is applied to the dies. Another outstanding feature of this press is the method of linking the counterbalance cylinders to the slide through a swivel-joint so that the slide can be trued up horizontally without straining the joint.

The new underdrive presses have been designed for automation. The low crown leaves ample head-room for the operation of cranes in one-story plants. All

piping and wiring for press controls, automatic work-handling devices, and maintenance power tool outlets have been built into the uprights.

Maintenance has been simplified by applying the "packaging" system to include sub-assemblies. For example, the clutch and brake have been standardized, and all main gearing is located in a single removable gear-case. Although all operating mechanisms are located within the press housing, the use of transparent plastic windows in the uprights and gear-case makes it easy to inspect the parts during operation. The slide adjustment mechanism is driven by worms and worm-wheels at all four corners of the slide. Each press is fitted with both high-pressure and low-pressure lubricating systems. Circle Item 107 on postcard, page 245

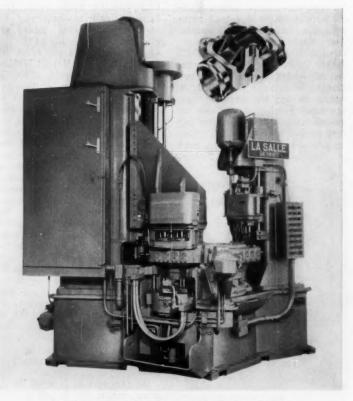
#### Special Machine for Processing Brake Cylinders

LaSalle Tool Inc., Detroit, Mich., has built a five-station, vertical, dial type machine that drills, chamfers, spot-faces, hollow-mills, and taps brake cylinders. This machine processes four brake cylinders at one time, employing automatic clamping and unclamping of the work. It produces 1028 brake cylinders per hour at 100 per cent efficiency. Only one operator is required to achieve this output.

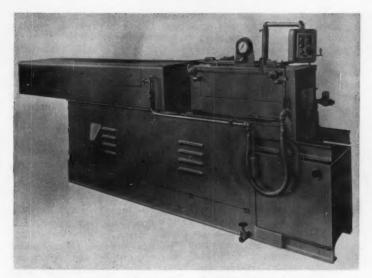
An eight-spindle head, working from the bottom up, produces a positive chamfer. This multiplespindle head is hydraulically operated and electrically controlled, and has an adjustable positive stop. It is mounted on hardened and ground guide bars and is located in the fixture on each cycle. The head is driven by a hydraulic fluid motor with a 5-H.P. output, thus eliminating the need for an electric motor.

The heads at the second, third, and fourth stations are of the pot type, which can be replaced if necessary without removing the platen. The drill heads operating downward are driven electrically, and those operating upward are driven hydraulically.

Circle Item 108 on postcard, page 245



LaSalle special machine for processing brake cylinders



Elmes descaling machine brought out by American Steel Foundries

#### Portable Billet-Descaling Machine

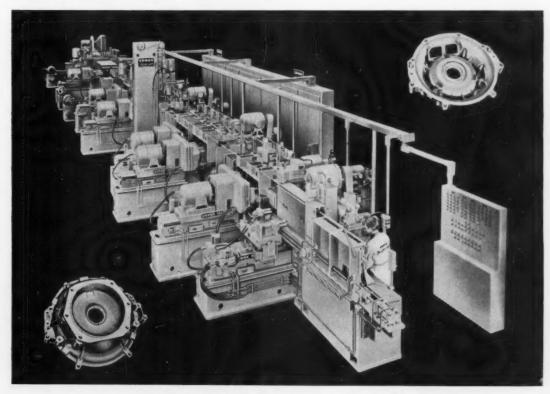
An Elmes portable, self-contained billet descaler that is semiautomatic in operation has been brought out by American Steel Foundries, Cincinnati, Ohio. This machine is designed to remove forging scale from hot billets immediately before closed-die forging operations. In operation the unit automatically sprays a small quantity of water at high pressure on the hot billet as it travels through the machine. The scalefree billet is automatically ejected from the machine. The entire descaling cycle for a billet 32 inches long requires only two seconds.

The descaler is designed for the preparation of billets for all kinds of forging operations. It will handle billets up to 32 inches in length by 6 inches in diameter and can be operated with either side or end feeding. The unit is completely equipped with shrouds which can be removed to facilitate making adjustments. All valves, pumps, piping and related items are mounted on the outside of the oil reservoir and are readily accessible. Complete separation of the water and oil systems is provided.

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#### Special "Transfer-matic" for Processing Flywheel Housing Assemblies

A "Transfer-matic" which processes two different types of flywheel housing assemblies for two different makes of car engines simultaneously has been announced by The Cross Company, Detroit, Mich. This machine rough- and



Cross "Transfer-matic" for processing automotive engine parts

finish-turns and faces the engine and transmission mounting faces; drills, bores, chamfers, reams and taps all holes; assembles the center bearing and two dowels; finish-bores the center bearing after assembly; and washes and dries the parts for final assembly. The production rate is 314 pieces per hour at 100 per cent operating efficiency.

The machine has twenty stations, including one loading, ten machining, two assembling, four inspecting, two cleaning and one unloading. All parts in these machines—even the tools—are made to interchangeable tolerances for fast, easy maintenance. Other features are: construction to J.I.C. standards, hydraulic feed and arpid traverse, hardened and ground ways, and automatic lubrication.

Circle Item 110 on postcard, page 245

jacket around the injectioncylinder ram reduces packing failure.

Cold-chamber units feature injection speeds of approximately 10,000 inches per minute, with pressures of about 33,000 pounds per square inch on the injected metal. The injection cylinder is adjustable to positions below the machine center line.

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#### Lake Erie Die-Casting Machine

The Lake Erie Engineering Corporation, Buffalo, N. Y., is offering a new line of die-casting machines designed to be "expandable." This line, designated Series D, includes machines having capacities of 250, 450, 650, and 850 tons in either hot- or cold-chamber models. The machines can be furnished as basic units, at a low initial investment, equipped with only the essentials required for a specific production job. Then, as production requirements change, additional features can be added quickly and at low cost.

All machines are equipped with

a knuckled wedge cam toggle. This self-compensating arrangement automatically takes up clearances in dies caused by heat expansion. The knuckled joint also eliminates shear stress on the pins when under locking pressure. Improved manifold valving serves to greatly reduce piping and joints. Flexible core-pull valving simplifies changing from one operating sequence to another.

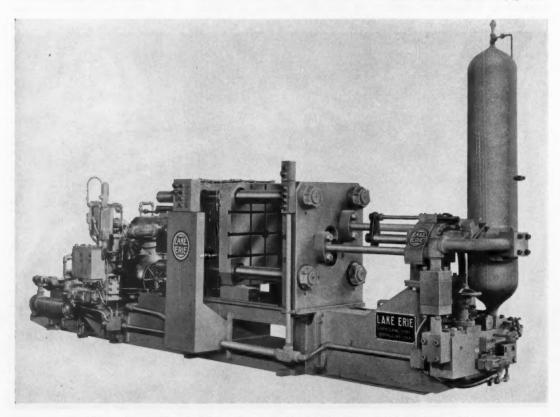
Machines equipped with a hotchamber injection unit feature a furnace that can be adjusted from the machine center line to positions below center. A water-cooled

#### Simonds "Red Tang" Files

The Simonds Saw & Steel Co., Fitchburg, Mass., has announced a complete line of "Red Tang" files, including American pattern files and rasps, "American-Swiss" Swiss pattern files, "Vixen" milled curved-tooth files and holders, and rotary files and burrs (high-speed steel and carbide).

This expanded line includes files especially adapted for use in saw filing; diemaking; precision instrument manufacture; automotive and aircraft production; and patternmaking; as well as for all kinds of filing operations performed in the machine shop.

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Die-casting machine available in four capacities in either hot- or cold-chamber models

#### Indexing Type Hollow-Milling and Threading Machine

The Hartford Special Machinery Co., Hartford, Conn., has built an indexing type hollow-milling and threading machine that employs two lead-screw tapping units and one cam-feed drilling unit in a four-station operation on forged-steel tie-rod sockets. An air clamping fixture holds the parts for the work cycle, which includes hollow-milling and threading stems, as well as drilling and tapping operations for Zerk fittings. The machine completes 430 parts per hour.

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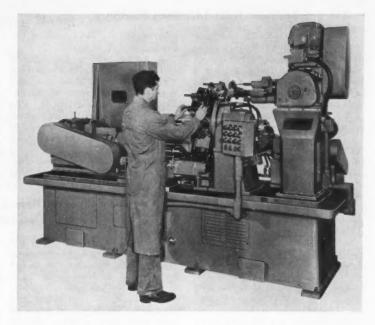
#### King Boring Mills Equipped for High Production

Vertical production boring and turning machines recently introduced by the American Steel Foundries, King Machine Tool Div., Cincinnati, Ohio, have been re-designed to provide stepped-up production, increased accuracy, and simplified maintenance. The 30- to 46-inch machines have power ratings of 40 to 50 H.P., while 56-inch and larger machines have been designed for ratings of 75 to 100 H.P.

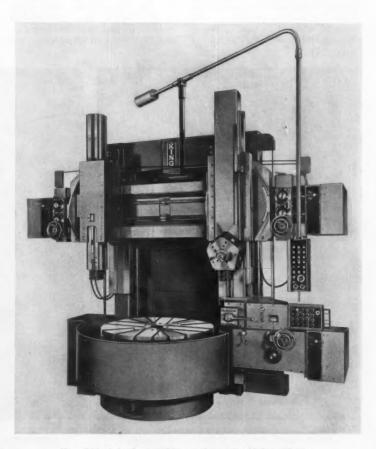
There are twenty-four spindle speeds in each of three ranges—high, intermediate, and low—all pre-selective from direct-reading dials. The complete drive transmission is mounted in an extrarugged housing and the entire drive can be removed from the machine as a unit. There are twenty-four feeds, ranging from 0.0016 to 0.250 inch per revolution, also pre-selective from direct-reading dials.

Complete electrical controls are located on a pendant station and on a fixed panel mounted on the side head for maximum ease and speed of manipulation. Additional features include outstanding new spindle and spindle mounting, automatic lubrication of all moving parts, and anti-backlash nuts for all cross-feed movements. The machine is adapted for simple optional addition of automatic positioning of heads, automatic tracing control of heads, and automatic cycling. It is also adaptable for power rail clamping power indexing of turrets.

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Hartford special hollow-milling and threading machine



King 56-inch boring machine equipped for high production

#### **Caser Radial Drilling Machines**

The Maserati Corporation of America, Westbury, N. Y., has introduced in this country a line of Caser radial drilling machines which range in size from the FR-11, with a 30-inch arm and a column 8 inches in diameter, to the FR-9, with a 96-inch arm and a column 22 inches in diameter.

The machines have single pushbutton clamping of column and head, in which pressure on the release push-button at the head (green) moves an arrow on the dial. When the arrow is at the middle of the dial, the head is released but the column remains clamped. When the arrow is all the way to the right on the dial, both head and column are released. Clamping is done by applying pressure on the red push-button, which automatically moves the arrow back to the "clamping area" on the dial.

Single-lever control is provided for power arm elevation. The arm is always clamped when the lever is in its neutral position. It is automatically unclamped and lifted when the lever is pushed up, and lowered when it is pushed down. The control lever is located on the

arm of Model FR-11 and on the head of all other models.

A single control for spindle start, stop, and reverse is combined with pre-selection of all available speeds while the machine is running on all models except the FR-11. A speed dial, with direct reading of spindle speeds, is provided for pre-selection of the next speed while the machine is performing the first operation. The feed dial, with direct reading of all available

feeds, has only one knob and can be operated while the machine is running and the feed is engaged.

Eight spindle speeds (ranging from 205 to 2300 R.P.M.) for the smallest size and twenty-four speeds (from 30 to 2000 R.P.M.) for the largest machine are obtainable by means of a pre-selector which provides for quick and safe selection of the correct speed for any operation. A graduated disc permits automatic regulation of the hole depth.

Circle Item 115 on postcard, page 245

#### Blast-Cleaning Barrel Designed to Perform Two Functions

A "Blastmaster" barrel made by the Pangborn Corporation, Hagerstown, Md., for use in the non-ferrous jobbing foundry of R. C. Hitchcock & Sons, Inc., Minneapolis, Minn., performs two functions. The Rotoblast wheel of this equipment throws chilled, cast-iron grit against the rotating parts in the barrel. In the case of the aluminum steak trays shown in the illustration, the Blastmaster barrel cleans the product to show up any imperfections during quality-control inspection and

at the same time imparts a frosted finish to one surface. The top surface of the tray is polished to a mirror smoothness, which makes a pleasing contrast with the frosted finish given to the bottom surface.

A Pangborn dust collector operates as a unit with the barrel. The dust from two grinding wheels is also received by the collector, which salvages over 350 pounds of aluminum per week in addition to keeping the plant dust-free.

Circle Item 116 on postcard, page 245



Radial drilling machine of Caser line introduced by Maserati Corporation of America



Blast-cleaning and finishing barrel manufactured by the Pangborn Corporation

#### Niagara "Styleline" Deep Throat Presses

A revolutionary crankshaft design, said to embrace numerous operating and structural improvements, has been incorporated in a new line of deep throat presses introduced by Niagara Machine & Tool Works, Buffalo, N. Y. These "Styleline" Series C presses are built in eight different models with capacities ranging from 22 to 150 tons, each available in several throat depths. They are designed to perform a variety of blanking, forming, drawing, perforating, combination die and automatic feeding operations in short change-over runs or highproduction set-ups.

The new front-to-back crankshaft permits not only spacesaving enclosed construction but also makes it possible to use a wider slide (left to right) and longer gibbing to provide greater support for wide dies and offcenter loading. The entire driving mechanism is concealed within the limits of the compact, all-steel frame. Gear and clutch members operate in sealed baths of oil. All gearing is enclosed within the press frame, eliminating overhung bearings and providing more rigid support to minimize shaft deflection.

Geared models are equipped with an exclusive electropneumatic clutch in connection with an airreleasing brake designed for fast, smooth operation. Non-geared models use the Niagara mechanical sleeve clutch and drag brake, but are also available with a pneumatic clutch trip and special airreleasing brake, the latter for use with automatic feeds.

All models are equipped with the latest operating controls to provide maximum protection for operator, die setter, and the press itself. Foot controls and engineered feeders for "automated" set-ups are also available.

Circle Item 117 on postcard, page 245

#### Ex-Cell-O "Method X" Tool Sharpening Machine

A "Method X" tool sharpening machine, which employs an electro-spark instead of an abrasive for sharpening carbide tools, is now available from the Ex-Cell-O Corporation, Detroit, Mich., and from Firth Sterling, Inc., Pittsburgh, Pa. The machine is built to NMTBA and J.I.C. standards by the Ex-Cell-O Corporation under license granted by the Method X Co., a subsidiary of Firth Sterling, Inc. The Ex-Cell-O Style 43 "Method X" machine shown in the illustration is designed primarily

for off-hand sharpening of singlepoint solid carbide and carbidetipped tools. It functions without diamond wheels or abrasives, the operating principle being relatively simple.

For a wheel, the machine uses a 10-inch cast-iron disc, connected to serve as the negative terminal of an electric circuit. Similarly connected, the tool itself becomes the positive electric terminal. A semi-solid dielectric film applied to the disc provides a spark gap of the proper distance between



"Styleline" deep throat press introduced by the Niagara Machine & Tool Works



"Method X" tool sharpening machine available from Ex-Cell-O Corporation and from Firth Sterling

those terminals. As the tool is oscillated across the wheel face, current pulsations are released as spark discharges. The high-current densities of the single-pulse discharge overcome the tensile strength of the material, and a minute particle is removed from the tool at this point. The resulting crater depth and diameter are proportionate to the energy discharged per pulse. Thus, rough or finish cuts can be obtained by simply setting a power selector switch to obtain the desired surface finish. Method X does not cause parallel or unidirectional tool marks, or grinding cracks.

One important feature of this method is its capacity to work materials of extreme hardness. Hard steels, cast alloys, and the carbides yield singly or in combination. If it is an electrical conductor, virtually any metal can be worked on the new tool sharpener. No coolant is used and no special skill is needed for the sharpening process.

Circle Item 118 on postcard, page 245

#### P&W Electrolimit Gage and Squareness Thread-Checking Fixture

A direct setting Electrolimit gage with a 6-inch testing range has been developed by the Pratt



Fig. 1. Pratt & Whitney direct setting Electrolimit gage

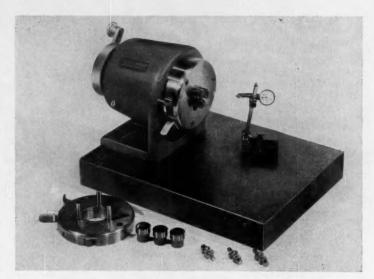


Fig. 2. Gage to check shoulder squareness of threaded parts

& Whitney Co., Inc., West Hartford, Conn. Standard gage-blocks are used to set the gage for even inches. Fractional inch settings are obtained by operating a handwheel that elevates the gage head through a precision micrometer screw. The desired setting is read direct to 0.0001 inch on the setting counter. Resetting within the established inch range is accomplished by simply turning the handwheel as required. Comparative readings to 0.00005 inch are obtained on a scale with a plus or minus 0.001-inch range.

Another new Pratt & Whitney product, a squareness threadchecking fixture, checks shoulder squareness relative to the center line of the thread. The fixture consists basically of a gaging head mounted on a precisionaligned spindle. Special ball thrust bearings insure squareness. In operation, a lever arm is actuated. opening gaging rolls carried on the gaging head. The product thread is placed on the rolls and the arm is released. The spindle and head are rotated by means of a hand crank and errors in squareness are easily read on a dial indicator. The fixture is mounted on a precision surface plate.

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#### Lincoln "Fleetweld" and "Jet-Hard" Electrodes

Two new types of electrodes that can be used with alternating or direct current have been introduced by the Lincoln Electric Co., Cleveland, Ohio. The "Fleetweld 37" designed for welding sheet metal or for steel plate fabrication is said to have excellent arc characteristics and can be used with smaller transformer type welders. It is available in 1/8-, 5/32-, and 3/16-inch sizes.

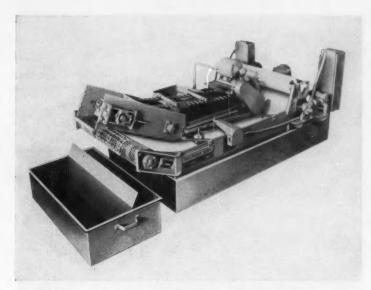
The "Jet-Hard BU-90" powder type electrode permits fast buildup of worn parts in maintenance and repair welding operations and is furnished in 5/32-, 3/16-, and 1/4-inch sizes.

Circle Item 120 on postcard, page 245

#### Magnetic Coolant Separator and Filter

A Delpark combined magnetic separator and filter for the separation of ferrous sludge and abrasives from coolants has been announced by the Industrial Filtration Co., Lebanon, Ind. The separator of this unit is said to have the greatest magnetic force ever developed for use in equipment of this kind. A new method of using the gravity flow of liquids over the magnets is employed to obtain the advantages of both gravity and magnetic separation.

The efficiency of the magnets in handling the heavy swarf load has made it possible to reduce the size of the filter while increasing the flow capacity. Also, the floor space required for the unit has been reduced 25 to 30 per cent and operating costs lowered. The combined



Delpark magnetic coolant separator and filter announced by the Industrial Filtration Co.

magnetic separating and filter units operate continuously at full flow capacity and are self-cleaning and fully automatic.

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#### DoAll Torque Screwdriver for Assembling Gage-Blocks

A specially designed torque screwdriver for use in assembling the recently announced line of square gage-blocks and accessories has been brought out by the DoAll Co., Des Plaines, Ill. Under most existing systems for assembling square gage-blocks into working gages, tie-rods are passed through the holes in the center of the blocks, and the stack is clamped by means of screws which fit internal threads at each end of the tie-rods, as illustrated in the announcement of the gages published in May, 1955, Machinery, page 218.

Tightening the screws with an ordinary screwdriver has led to inconsistencies, since the ultimate clamping pressure is dependent upon the variable element of "feel." Too much pressure causes distortion of the blocks with consequent errors in dimensions.

The new torque screwdriver "slips" at a fixed torque established by laboratory tests as sufficient to maintain a rigid assembly of wrung blocks without causing distortion. Because direct clamping pressure sufficient to wring the blocks would result in distortion, the torque screwdriver is intended for use after the blocks have been cleaned and wrung together by hand in the accepted manner.

The torque screwdriver features a hardened and chromiumplated nib. Turned clockwise, the screwdriver applies the proper pressure to the assembly—counter-clockwise, the nib locks to the knurled handle so that the clamping screw may be loosened.

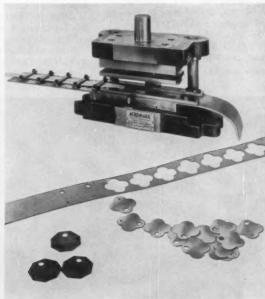
Circle Item 122 on postcard, page 245

#### Acromark Versatile Die Set

A series of punches, stamps, blanking dies and other equipment can be assembled in a die set made by the Acromark Co., Elizabeth, N. J., for use in the production of safety tags, seals, production tags, cloak-room checks,



DoAll torque screwdriver for assembling gage-blocks



Versatile die set made by the Acromark Co.

and other tags or tickets. The die set is of the sleeve type and can be fitted on any regular punch press having a capacity of 10 tons or more.

The assembly consists of a set of hole punches followed by a set of dies for stamping the name, trademark, or any lettering desired. The third or succeeding operation consists of blanking the tags or checks. An automatic numbering head, actuated at each stroke of the press, can be located ahead of the first operation tool for stamping the correct number on each consecutive piece. The various die-set units are mounted on one bedplate and on the upper spring release block, and the material, which may be fiber or metal (usually brass), is fed through the die set from a roll or from strips to the left of the punch press. As each check or disc is completed, it drops off a chute either at the rear or side of the punch press.

The production of checks and tags on the completely assembled die set can be as high as several hundred tags per minute. On a large size press that will handle two sets of series dies, the production can be doubled. The dieset assembly can be adjusted for a stroke ranging from 1/2 inch to 2 or 3 inches. The die set should be mounted on a press with a hole in the bed to allow punched cente. s to drop through.

The closed height of the die set can be 7 1/2 inches or larger, and the shank can be 1 inch and upward. Any larger hole in the ram will require a sleeve for the shank. The assembly is approximately 15 3/4 inches long, 8 1/2 inches deep, and 9 inches high.

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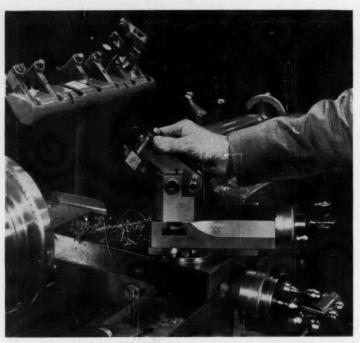


Fig. 1. "Quik-Tool" attachment for Monarch lathes automatically positions tool-holders for various machining operations.

#### "Quik-Tool" Attachment for Monarch Lathes

A "Quik-Tool" attachment for use on 10-inch EE Monarch manufacturing and toolmaker's lathes has been introduced by the Monarch Machine Tool Co., Sidney, Ohio. This attachment consists of a precision ground tool-block that is fitted to the compound rest of the lathe and a set of seven precalibrated tool-holders.

The tool-holders can be changed quickly, and automatically position themselves when slipped on a locating pin and swung into a slot provided in the tool-block, as shown in Fig. 1. The close fit of the tool-holders in this block eliminates clamping and positioning of the tools and insures rigidity and accuracy. The unit permits turning, threading, facing, boring, knurling and cutting-off operations on the work, in any sequence. A special holder with a dial indicator reading in 0.0001 inch is included in the "Quik-Tool" set.

A rack, Fig. 2, is supplied with

A rack, Fig. 2, is supplied with each set and is mounted in a convenient position at the rear of the lathe to hold the array of seven tool-holders.

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#### Scully-Jones Close-Center Tap-Drivers and Heavy-Duty Tap-Holders

Tapping closely spaced holes and holes located in places difficult to reach can be easily accomplished with a new line of tap-drivers and chucks produced by Scully-Jones & Co., Chicago, Ill. These drivers are made with small body diameters, as shown in the upper three views in the accompanying illustration, and are available in short, medium, and long series. They are especially adapted for pulley tap-

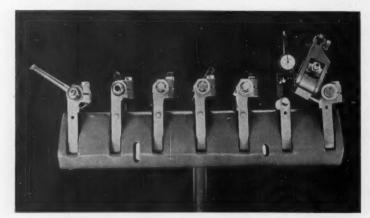
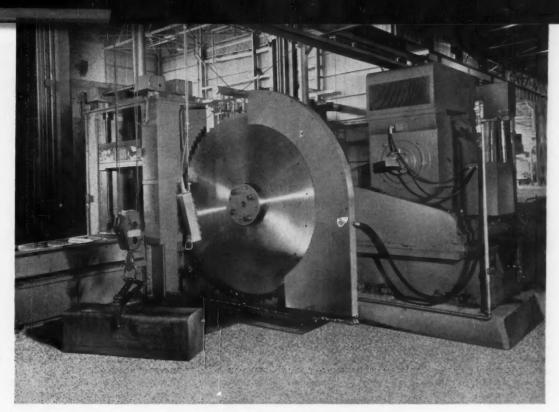


Fig. 2. Rack mounted on rear of lathe holds set of seven tool-holders.



Motch & Merryweather 7-foot circular saw powered by General Electric motor

ping, their body diameters being only slightly larger than the shanks of pulley taps.

The tap chuck is split on four sides to give a true collet-gripping action on the shank of the tap and provide increased resistance to pull-out. It is made of alloy steel, hardened for maximum spring properties and resistance to wear. The square end on the tap engages the broached square in the chuck to eliminate slipping, and the shanks of the driver and chuck have tangs that provide a positive drive. The driver is also made of alloy steel and hardened. The assembled driver and chuck run true within 0.002 inch. Each driver will take chucks of two or more sizes.

The heavy-duty tap-holder shown in the lower view of the illustration is designed for use in radial drills, drill presses, lathes, boring mills, milling machines, and tapping machines. This tap-holder has been designed primarily for driving large hand and pipe taps. A new style snap-ring facilitates insertion and removal of taps.

The square on the tap shank fits securely in the broached square of the holder to provide a positive drive which eliminates slipping and possible tool damage. Concentricity between the holder shank and bore is held within 0.002 inch, gaged at a distance equal to the

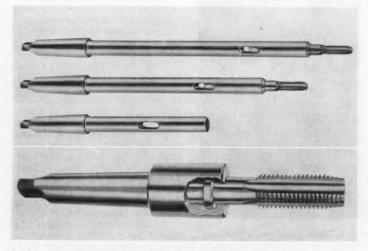
projection of a standard tap from the holder, assuring a true-running tool which helps eliminate over-size tapped holes.

These holders can be used to drive tools that are to be dropped through the work and also for tools which do not form a functional part of the holder. In addition to driving taps, they provide a rugged, square drive for reamers, staybolt setters, flue expanders, and similar tools.

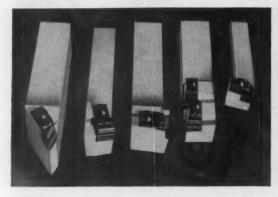
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#### General Electric Motor for Motch & Merryweather Saw

A 7-foot circular saw, manufactured by the Motch & Merryweather Co., Cleveland, Ohio, is being used to cut through aluminum ingots almost 3 1/2 feet thick. This huge saw, which rotates at speeds up to 46 miles an hour, is powered by a General Electric direct-current motor. A unit-cooler, operating on a heat-exchange principle, protects the



Close-center tap-drivers and heavy-duty tap-holder



Carbide inserts and holders introduced by Valenite
Metals Corporation

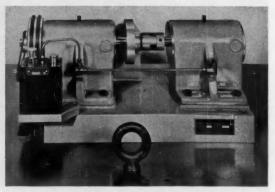


Fig. 2. Bijur lubricator automatically filters oil flow to the "Wavometer."

motor from metal dust thrown off by the whirling blade. An adjustable-speed drive permits the saw to be run at speeds ranging from 1360 to 4100 surface feet per minute, depending on the grade of aluminum to be machined.

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#### Valenite Holders and Carbide Inserts

The Valenite Metals Corporation, Royal Oak, Mich., has announced additions to its line of

GOU

Fig. 1. "Wavometer" made by Micrometrical Mfg. Co. measures surface variations on cylindrical parts.

carbide inserts and throw-away holders. General-purpose and heavy-duty carbide tips now come in three thicknesses which can be adjusted to an individual holder by the use of standard carbide shim seats. The holders feature an adjustable chip-breaker which is pinned to the insert clamp and will not fall out when the tip is changed. New style holders for machining non-ferrous metals have been designed, and semistandard and special-purpose holders are available for various operations.

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#### "Wavometer" Equipped with Automatic Lubricator

Micrometrical Mfg. Co., Ann Arbor, Mich., has developed a precision testing "Wavometer" to measure surface waves around ball and roller bearing races. Cylindrical parts are rotated on a vibration-free motor-driven spindle, and an electromagnetic transducer is applied to the surface to be inspected, as shown in Fig. 1.

This tracer produces an electric voltage proportional to the waves around the circumference of the part. An amplifier transmits this voltage to two dials with micro-inch scales that indicate the average height of the waves and to an oscilloscope—a small screen that presents surface characteristics in a visible line. A loud-speaker system also converts these waves into sounds of different frequencies that indicate their amount of irregularity.

An automatic lubricator was designed by the Bijur Lubricating Corporation, Rochelle Park, N. J., to oil the two bearings that are

fitted to the spindle of the testing machine. This unit is attached to the "Wavometer," Fig. 2, and is powered by the spindle. The lubricator feeds exactly 1 cubic centimeter of filtered oil per hour to each bearing.

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#### Greaves Milling Attachments

A universal milling attachment, Fig. 1, a plain and a universal 10-inch dividing head, Fig. 2, and a toolmaker's over-arm unit, Fig. 3, are three new products of the Greaves Machine Tool Division, J. A. Fay & Egan Co., Cincinnati, Ohio.

Intricate milling operations, including tool-work on jigs, fixtures and dies, or gear cutting can be performed on a Greaves horizontal milling machine when equipped with the universal milling attachment. This unit has two graduated swivels which enable the head to be rotated 360 degrees in each of two planes to provide any desired cutter position. It can also be employed to mill spirals when used in conjunction with a dividing head and lead attachment as is illustrated in Fig. 1. The device is fixed to the machine column face with three bolts and supported by the arbor and over-arm. The speed of the attachment spindle is the same as that of the machine spindle, and either a No. 10 B & S or a No. 40 N. S. spindle nose can be furnished. Smaller cutters are mounted in Style C arbors and locked in place with a draw-in bolt.

The dividing heads, Fig. 2, facilitate milling operations on spline shafts, spur and helical gears, and multi-sided tools such

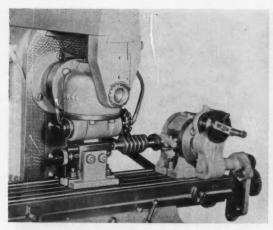


Fig. 1. Greaves universal milling attachment set up to machine a spiral.

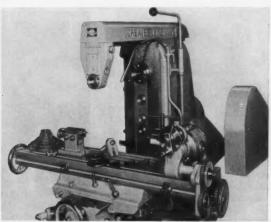


Fig. 2. Universal 10-inch dividing head and its component parts.

as tapered reamers. Both plain and universal heads are used with a No. 10 B & S taper spindle and have an index ratio of 40 to 1. Each head is furnished with three index plates, an adjustable tailstock, and a center-drive dog.

The universal dividing head is equipped with a spiral driving mechanism that will provide leads from 0.670 inch to 80.625 inches. It will index for odd divisions to 49 and for even divisions to 96. A complete set of change-gears and a guard for covering the spiral driving mechanism come with this head.

Both units have a 10 3/4-inch swing and a 1 3/32-inch spindle

hole. Optional attachments include a 6-inch three-jaw chuck, a 6-inch four-jaw chuck, a direct indexing attachment, a 360 degree graduated swivel base, and high division index plates.

The Greaves toolmaker's overarm, Fig. 3, consists of a heavy-duty over-arm, a universal milling head, a motor, and a drive. It is mounted on a Greaves milling machine and permits two milling operations, one horizontal and one vertical or angular, to be performed simultaneously.

The unit has the same spindle taper as the Greaves horizontal milling machine (No. 50 N. S.), permitting tools and arbors to be

interchanged. In addition the overarm is equipped with a hand-feed quill attachment which has a No. 2 Morse taper for drilling operations. The quill device permits a 4-inch tool travel of the spindle.

A 2-H.P. motor provides 8 spindle speeds, obtained through sliding clutches. The universal head, equipped with a graduated swivel, can be positioned at any angle.

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#### Cut-Off Machine Designed for Automation

A model 48-W Bridgeport abrasive cut-off machine designed for incorporation in automation production lines has been introduced by the Lobdell Division, United Engineering & Foundry Co., Wilmington, Del.

An air cylinder and hydrocheck arrangement actuates the head, saving time and reducing wheel costs. The vise is also operated by an air cylinder. A feeding mechanism grips the material and moves it into position for the cut-off operation. A series of micro switches serves to combine these operations into a smooth cycle that repeats automatically.

The stainless-steel spindle is equipped with grease-sealed bearings. Coolant is applied equally at both sides of the cut, and the vise holds both ends of the piece while it is being cut off. Ample power is supplied by a 7 1/2-H.P. motor. The swivel head provides for accurate angle cutting. Accurate counterbalancing of the head is accomplished by proper location of the motor.

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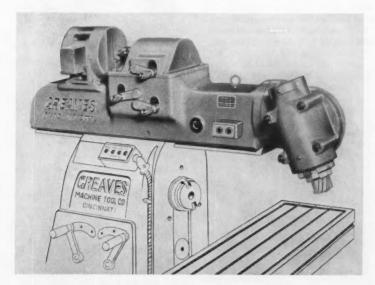


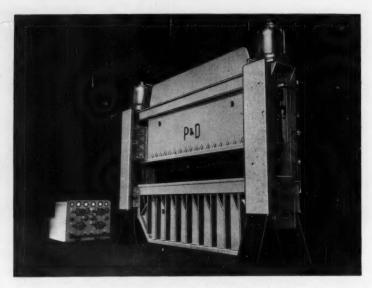
Fig. 3. Tools and arbors for the Greaves toolmaker's over-arm and milling machine are interchangeable.

#### Philips & Davies Hydraulic Press

A 1000-ton capacity hydraulic press has been announced by Philips & Davies, Inc., Kenton, Ohio. The unit is extremely compact: the over-all length is 26 feet 1 inch; width 4 feet 6 inches; and over-all height above floor, 16 feet 5 1/2 inches. Open-end housings permit passage of work through the press. All units are furnished with a completely automatic and extremely sensitive ram-leveling device, as well as a ram tilting arrangement.

By re-arrangement of members within the pumping units, four different ram speeds can be provided, with a wide adaptation of working cycles. All obstacles to passing work quickly and easily through the press have been removed in order to permit handling unusually large parts. Heavy steel plate up to 7/8 inch thick by 19 feet long can be processed. The unit is adaptable to many pressing operations such as forming, blanking, bending, straightening, and drawing.

The press measures 20 feet between housings; has a stroke of 16 inches; open height of 33 inches; closed height of 17 inches; ram speeds of 28 1/2 to 89 1/2



Hydraulic press announced by Philips & Davies, Inc.

inches per minute; pressing speed of 4 1/2 to 48 inches per minute; and return speed of 58 to 93 inches per minute. When the press ram reaches approximately one-quarter of its tonnage capacity, it will automatically slow down to a pressing speed of 4 1/2 to 13 inches per minute.

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tacts are mounted on frictionlessmotion transfer units that relay the amount of movement to Federal airprobe gaging spindles.

The Federal gage shown in Fig. 2 is used to check the inside and outside diameters of bearing sleeves for taper or wear conditions. Three sizes of gaging contacts are provided to permit

#### Parallelism Air Gage for Bores, Gage for Bearing Sleeves, and Gage for Compression Blades

A dual Dimensionair air gage, Fig. 1, that checks the parallelism of two different size bores in two planes has been introduced by the Federal Products Corporation, Providence, R. I. Sensitive gaging contacts check the position at the side and bottom of expanding precision mandrels placed in the bores and located in V-blocks. These con-



Fig. 1. Federal air gage checks parallelism of bores.



Fig. 2. Gage designed to check bearing-sleeve taper or wear.



Fig. 3. Jet engine blade checked at six points by Federal gages.

checking 1/2-inch to 5-inch inside diameters.

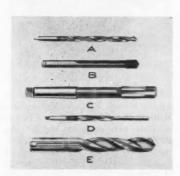
The thickness of a jet engine compression blade is checked at six different locations simultaneously by the Federal gages shown in Fig. 3. A spring-loaded plunger holds the blade in place and a hand lever moves the gaging contacts into position. Dial indicators show any deviation from the dimensions established by a master part.

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#### Chicago-Latrobe Special Drills and Reamers

Special drills, reamers, and combination tools, such as shown in the accompanying illustration, are being manufactured to meet the users' specifications by Chicago-Latrobe, Chicago, Ill. These special tools are manufactured under quality control and can be furnished in high-speed steel or carbide. It is claimed that a combination drill and reamer of the type shown at A, designed to perform both the drilling and reaming operation in one pass, has in many cases resulted in a better product at greatly reduced manufacturing costs.

"Harduty" drills with highspeed steel bodies and with an
extra heavy-duty carbide-tipped
point of the design shown at B
are used to drill accurate holes in
hardened die steel heat-treated to
Rockwell C-40. These drills are
generally used in tool-room applications to produce holes in hardened steel without annealing the
walls or surrounding surface of
the hole. They produce holes with
good micro finishes, hand feed
being used to obtain best results.
This type drill is regularly available in twenty-three sizes in the



Special drills and reamers made by Chicago-Latrobe

full range from 1/16 inch through 3/4 inch in diameter, varying in increments of 1/32 inch.

Carbide "Harduty" reamers, such as shown at C, are available with taper shank and straight flutes in six sizes ranging from 1/4 inch to 3/4 inch. These drills and reamers have been developed to save time in tool and die shops and eliminate scrapping of expensive dies. Where a hole has been omitted, it can now be drilled even after the die has been hardened.

Piloted reamers of the design shown at *D* are made to suit specific requirements in both highspeed steel and carbide.

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#### New Insulation Applied to G. E. Improved Direct-Current Armored Motors

An improved line of direct-current armored motors with an advanced insulation utilizing Class H materials has been announced by the General Electric Co., Schenectady, N. Y. Motors with the new insulation, now in production at the company's Direct Current Motor & Generator Department, Erie, Pa., are capable of withstanding temperatures of 180 de-



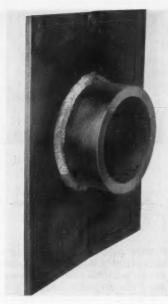
Compound field coil with Class H insulation used on improved G. E. direct-current motors

grees C. as compared to 130 degrees C. for motors with the Class B insulation previously employed. Laboratory tests indicate that Class H insulation will outlast the Class B insulation 32 to 1.

A partly stripped compound field coil with the new Class H insulation is shown in the accompanying illustration. Layers of mica A insulate leads and terminals from the coil body. Ties of Fiberglas tape B pretreated with silicone varnish hold portions of the coil in place during and after winding. Outer wrapping of glass tape C is applied after impregnation and mica tape D is used to increase dielectric strength and resistance to heat.

Class H insulation is defined by the American Institute of Electrical Engineers as insulation consisting of mica, Fiberglas, asbestos, and similar inorganic materials in built-up form with binding substances composed of silicone compounds or materials with equivalent properties.

Circle Item 134 on postcard, page 245



A 3-inch pipe welded to 1/4-inch plate in the position shown with Lincoln "Improved Fleetweld 47" electrode

#### Lincoln All-Position Iron-Powder Electrode

An all-position, iron-powder type electrode, called "Improved Fleetweld 47," was announced recently by the Lincoln Electric Co., Cleveland, Ohio. This electrode is said to give exceptional results in out-of-position, as well as downhand, welding, and it especially facilitates high-speed welding of mild steel in all positions on either alternating- or direct-current welding.

Powdered iron is included in the coating to produce higher deposition rates, which are claimed to result in 10 to 30 per cent higher welding speeds than those obtained with conventional electrodes. The coating also produces greater footage per electrode, up to 30 per cent more inches of weld per electrode being claimed as a result of this feature. Bead appearance is smooth and clean with minimum spatter. Slag is practically self-cleaning. The arc is smooth, soft, and stable in all positions, and has no tendency to stick on either alternating or direct current. This electrode can be used with either a drag or short arc technique, and is available in sizes from 1/8 to 5/16 inch in diameter.

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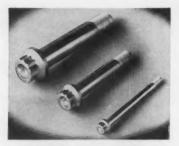


Fig. 1. Standard Pressed Steel high-strength steel bolts.

#### Standard Pressed Steel High-Strength Bolts and Lock-Nuts

High-strength bolts and locknuts of new design have been made available by the Standard Pressed Steel Co., Jenkintown, Pa.

Steel 12-point external wrenching bolts, Fig. 1, known as EWB-18 are said to have a tensile strength range from 180,000 to 200,000 pounds per square inch. This is made possible by precision forming of the threads and controlled forging of the bolt head. Considerable reductions in size and weight are realized and the 12-point design of the heads permits maximum tightening of the bolts.

The titanium flush-head shear bolts, shown in Fig. 2, can be substituted directly for alloy-steel bolts weighing 75 per cent more. Fasteners of this type are used extensively in aircraft design. The use of titanium bolts with a shear strength greater than that of steel bolts of the same size represents an important weight-saving advantage.

Miniature self-locking nuts, Fig. 3, are available in sizes 0-80 to 4-48. Made from aluminum or brass.

Circle Item 136 on postcard, page 245

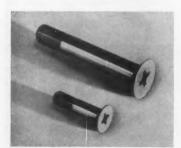


Fig. 2. Titanium wrenching bolts with high shear strength.

#### Ingersoll-Rand Nut-Running Tool with Torque Control

The Ingersoil-Rand Co., New York City, has announced an air-operated impact nut-running tool equipped with torque control. This "Impactool" is designed to run a nut to the desired torque, then automatically shut itself off. It is said to incorporate the first application of the torsion-bar prin-



Nut-running tool with torque control made by Ingersoll-Rand Co.

ciple to torque control. While the nut is being run to the required torque the "Impactool" operates at normal power and speed, but when the required torque is reached and nut-running resistance is equal to the pre-set stress, the impact mechanism rebounds instantly and trips a rubber-faced shut-off valve.

The torque setting is easily and quickly made by using a jig which turns a torsion bar and calibration collar to the desired reading against rigid splines on the torque bar adjusting sleeve. The tool can be set to the required torque in a few seconds. It comes in two sizes. Size 5040T, especially useful in general industry, has two torsion bars-available; the L735 torsion

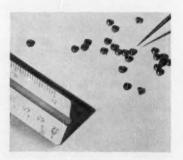


Fig. 3. Miniature "Flexlocs" made by Standard Pressed Steel Co.

bar with a maximum torque of 60 foot-pounds and the H735 bar with a maximum torque of 90 foot-pounds. Size 5340T "Impactool" is pre-set at 320 foot-pounds when shipped from the factory and can be easily adjusted up to a maximum of 550 foot-pounds. This larger size tool has been developed for steel construction nutrunning in the building of industrial plants, office buildings, and bridges, as well as for heavy bolting-up work in general industry.

#### Motors Built to Reduce Starting Shock

Motors designed to reduce starting shock and power line disturbances, and to comply with power company requirements for limited current inrush, are being manu-



Howell motor of improved design

factured in a wide range of sizes by the Howell Electric Motors Co., Howell, Mich. The improved motor designs are said to reduce the locked rotor current to approximately 65 per cent of the normal amount and the starting torque on the first step to about 50 per cent of the full voltage starting torque.

For two-step starting, half of the motor's winding is energized across the line as the first magnetic contactor closes. At the end of a timed cycle, the second contactor closes to bring in the second half of the winding in parallel with the first. In typical three-step starting, the motor starts with reduced voltage on the first winding, accelerates as full voltage is added, and then, in the third step, reaches rated speed as the second winding is brought in at full voltage.

Circle Item 138 on postcard, page 245

#### Planer Gages, Magnetic Hold-Downs, and Pocket Scriber

Two new planer gages announced by the Lufkin Rule Co., Saginaw, Mich., are made with extra wide bases, designed to provide greater stability. Both gages have increased capacity (up to 10 3/4 inches with extensions) and a new plumb level, as shown in Fig. 1, for use when the gage is employed in a vertical position. The No. 901A planer gage also features a rapid adjustment locking device for quick positioning and fine adjustment for final, precise setting. Both gages are available with a 3-inch extension, in a fitted mahogany case, or in sets which include both 1- and 3-inch extensions, a straight scriber, an offset scriber and gage extension, and a scriber-holding attachment.

Magnetic hold-downs like the one shown in Fig. 2 have been added to the Lufkin "Miti-Mite" line of magnetic tools. Each hold-down is swivel-mounted in an aluminum plate containing two per-



Fig. 1. Lufkin planer gage

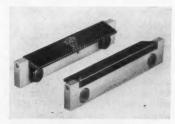


Fig. 2. Magnetic hold-downs made by the Lufkin Rule Co.



Fig. 3. Lufkin pocket scriber

manent magnets that can be attached instantly to the jaws of a vise. These hold-downs can be securely positioned to hold the work, eliminating the need for blocking or shimming.

Another new Lufkin product is the "Scriber-Matic," Fig. 3, which looks and operates like a ball-point pen. The point of this scriber can be extended by simply pushing a button in the cap. The point retracts safely into the barrel when the pocket clip is depressed.

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Le Count work-holding mandrel

#### **Miniature Mandrels**

A special 5/16-inch miniature mandrel, designed to provide accurate means of holding and locating a precision aircraft part for semi-automatic finish-grinding to a shoulder, has been brought out by Le Count Tool Works, Inc., Hartford, Conn. An expansion range of 1/32 inch, a stop for positive location, and an arrangement which eliminates the need for an arbor press in loading the work on the mandrel are features of this new product.

Circle Item 140 on postcard, page 245

#### **Abrasive Cut-Off Wheels**

A new line of "Aloxite" aluminum oxide resinoid cut-off wheels, called the B7, has been announced by the Bonded Abrasives Division of the Carborundum Company, Niagara Falls, N. Y. This line of cut-off wheels is designed to combine all of the qualities essential for dry cutting-off operations. Fast, cool cutting; sharp sides on



Cut-off wheels of B7 line recently introduced by Bonded Abrasives Division of the Carborundum Company

all wheels that prevent binding in the cut; and simplified grading for customer convenience are features offered in this line.

Three grades of wheels are available-"R" for operations that require burning and burring to be held to the minimum; "T" for general-purpose work where some burning and burring are acceptable; and "V" for rough work where maximum wheel life is the most important factor. Wheel sizes range from 6 to 20 inches in diameter and 1/16, 3/32, and 1/8 inch in thickness. Metal bushings are supplied for all arbor holes in the size range from 5/8 inch to 1 3/8 inches in diameter. All wheels are available in 24 to 120

Circle Item 141 on postcard, page 245

#### McKay Low-Hydrogen Iron-Powder Electrode

A low-hydrogen, iron-powder welding electrode has recently been added to the line of electrodes manufactured by the Mc-Kay Co., Pittsburgh, Pa. This new electrode, classified as E-7016, has been developed to combine the outstanding operating characteristics and versatility of low-hydrogen electrodes with the increased deposition rate of the iron-powder grades. The deposition rate is as much as 35 per cent higher than those obtainable with conventional low-hydrogen coatings. It is claimed that smooth, uniform, vertical or overhead welding can be performed with this electrode quicker and easier than formerly was believed possible. This means less welder fatigue and improved over-all welding efficiency.

Circle Item 142 on postcard, page 245



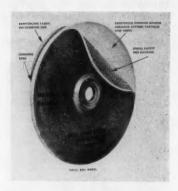
#### Onsrud Carbide-Tipped Spiral Cutters

A line of carbide-tipped, true spiral shaping cutters has been perfected by Onsrud Cutter Mfg. Co., Libertyville, Ill. The helical blade is formed in manufacturing and is of standard metallurgical quality. A 20-degree helix angle and 15-degree positive rake suit most applications. These cutters are especially suited where the length of the cutting edge is extreme—over 50 per cent of diameter—and where material is loose- or fibrousgrained.

Circle Item 143 on postcard, page 245

#### Abrasive Wheels for Portable Grinders

A special web backing of spiralwound, rayon auto tire cord imparts extra strength and safety to the "Simex" Red Wheel line of high-speed abrasive wheels, developed by Simonds Abrasive Co., Philadelphia, Pa. These wheels are



lightweight, have a reinforced resinoid bond, and are designed for portable disc type grinders. They are made in depressed center

or raised hub shapes in 7- and 9inch diameters and 3/16- and 1/4inch thicknesses. Intended for rough, tough application, the wheels are suited for removing welding flash and bead, cleaning up ragged surfaces and edges, and for all types of stainless steel. The manufacturer claims they outlast conventional abrasive cloth discs as much as 40 to 1. The wheel is more than a laminated product, being made, like a conventional grinding wheel, from a reinforced wheel mix consisting of abrasive cutting particles and a synthetic resin bonding agent. The grinding side is further strengthened with a layer of fabric. A file-like pattern increases cutting action.

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#### Clark Toggle Switch Motor Starter

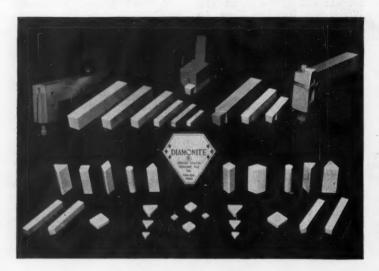
Toggle switch, alternating-current manual starter added to line of industrial controls made by Clark Controller Co., Cleveland, Ohio. These starters are available in single- or double-pole types for manual across-the-line starting of small single-phase, alternatingcurrent motors at a maximum of 220 volts for 25- to 60-cycle alternating current. Bi-metallic thermal overload protection is provided with interchangeable heaters, which cover the entire starting range. Heaters can be readily interchanged without removing the starter or wiring connections. Other features of this manual starter include adequate wiring space; positive action, trip-free silver-to-silver contacts; and rugged construction. Available in general-purpose, weatherproof, explosion-proof, and open or flush types with single-gang flush plate. Circle Item 146 on postcard, page 245

#### "Diamonite" Ceramic Cutting Tools

"Diamonite," a synthetic sapphire substance in bond, has been introduced to the ceramic cutting tool field by Diamonite Products, Canton, Ohio. This material consists essentially of aluminum oxide and is ground with diamond abrasives. Metal alloys, plastics and abrasive materials can be machined with these "Diamonite" tools at extremely high surface speeds.

The cutting edges will withstand high temperatures, and since there is no building up of metal on the cutting tool by fusion, fine finishes are obtained. Rigid over-all support of the tools is of utmost importance. Holders similar to those used for insert type tools are recommended to eliminate vibration and prevent breakage.

Circle Item 144 on postcard, page 245





#### **Dixon Parts Escapement**

Dixon Automatic Tool, Inc., Rockford, Ill., announces a standardized escapement unit to be attached to feed tracks. Spring-loaded fingers on this device can be shaped to accommodate parts up to 3 inches in diameter and will automatically release as many as 200 individual parts per minute. These escapements are available for solenoid or air cylinder operation. Mechanical linkage can be used if there is a vertically moving member on the machine to which the escapement is applied.

Circle Item 147 on postcard, page 245

#### Solenoid and Cover for Ross Valve

The Ross Operating Valve Co., Detroit, Mich., has developed a solenoid and cover assembly for use on all Ross base-mounted "Introld" (pilot operated) valves. It can be used on three-way and fourway type valves ranging in size from 1/4 inch to 1 1/4 inches. The solenoid can be operated manually



without removing the cover and is electrically inoperative when the cover is removed. The assembly features ring type connectors, a threaded electrical conduit connection, provision for piped exhaust and captive type cover fasteners.

Circle Item 148 on postcard, page 245

#### "Taper-Mike" for Measuring Tapers without Removing Work from Machine

"Taper-Mike" was recently placed on the market by the Taper Micrometer Corporation, Worcester, Mass. This instrument checks and measures the taper of work while



it is still on the grinder or lathe centers. It is adapted for use on production work, eliminates costly down time, and is accurate up to 0.0001 inch. Model No. 2 has a capacity of 0 to 1 1/4 inches and accommodates up to No. 40 standard milling machine tapers, up to No. 10 B & S tapers and up to No. 4 Morse tapers. Model No. 3 has a capacity of 1 to 2 inches and accommodates up to No. 50 standard milling machine tapers, up to No. 12 B & S tapers, and up to No. 6 Morse tapers. Larger models are made on application.

Circle Item 149 on postcard, page 245

#### Universal Helix Type Work Clamp

A newly developed Deckel universal, helix type work clamp has been made available by Cosa Corporation, New York City. Work can be clamped at any height by moving an adjustable support to



rest on steps placed around the axis of the clamping bolt. The slotted clamp slides in a groove on this support to permit clamping close to the work. For greater flexibility the clamp can be turned 180 degrees to allow either the flat or the L-shaped end to be used. Helix clamps come in eleven different sizes and can be used on work up to 12 5/8 inches in height.

Circle Item 150 on postcard, page 245

#### Taylor "HI-EFF" Drilling Machine

The Taylor Dynamometer & Machine Co., Milwaukee, Wis., recently added a new model to their line of "HI-EFF" sensitive drilling machines. This new unit is designed for high quality precision drilling on a production basis. The combined run-out of spindle and chuck is 0.0005 inch or less, and spindle speeds range from 800 R.P.M. to 10,000 R.P.M. Hole sizes from 0.001 to 0.125 inch in diameter can be drilled with this machine

Circle Item 151 on postcard, page 245 (This section continued on page 230)



from any angle..

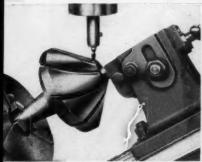
OMNIVERS

## in any plane... TODAY'S MOST VERSATILE MILLING MACHINE:

Here's the most outstanding combination of work-range, flexibility, and accuracy obtainable in a single milling machine! It's the Brown & Sharpe No. 0 Omniversal—specifically designed to handle toolroom, experimental, and prototype work—any difficult milling. Provides high accuracy machining at both simple and compound angular settings in any plane, without special equipment—even for taper spiral milling! Often permits all machining operations for a complete job without relocation of workpiece. And overall super-precision permits angular settings to 2 minutes!

Illustrations show how easily the Omniversal handled a difficult job for one manufacturer. For your plant, too, it's the most efficient, most economical way to handle *all* high precision, multi-operation machining. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

#### Only the Omniversal Can Handle Jobs like this!



Problem: Mill taper spiral milling cutter.

Step 1. Tilt table to obtain uniform depth of flutes.



Step 2. Gear dividing head to provide spiral.



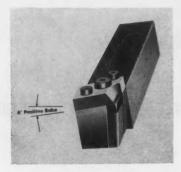
Step 3. Use rail to obtain horizental travel.

#### SPECIFICATIONS

3FECIFICATIONS	
Table feed	17'
Knee Slide feed	17'
Total horizontal feed	34'
Transverse feed	53/4'
Vertical adjustment	15'
Avial hand food of Omeliannel Millian Hand	04

Buy through our pay-as-you depreciate machine tool plan

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#### Vascoloy Positive-Rake Tool-Holder

Tool-holder for throw-away inserts, incorporating a 6-degree positive side rake, introduced at the Production Engineering Show by the Vascoloy-Ramet Corporation, Waukegan, Ill. Initial production of this tool-holder will be limited to the shank sizes most commonly used, and in the styles for straight turning and 15-degree lead-angle turning. However, production plans call for a complete series of shank sizes and standard styles. The new toolholder is adapted for use in machining metals and materials requiring the use of positive rake tools, including aluminum, soft brass, copper, bronze, stainless steel, alloyed steels, plastics, and other materials. Incorporated in the tool-holder is a new cast-alloy chip-breaker plate with unusually high resistance to abrasive wear. The addition of this new plate eliminates the necessity for grinding chip-breakers in the cemented carbide insert. The new chip-breaker plate is available in two styles; that is, a standard plate incorporating a chip-breaking width which meets standard practice, and a blank plate which may be ground with standard grinding wheels to fit individual machining problems.

Circle Item 152 on postcard, page 245



#### Vickers Pilot-Operated Check-Valve

Gasket - mounted, pilot - operated check-valve for use with 3/8-inch piping in industrial oil-hydraulic systems now available from Vickers Incorporated, Detroit, Mich. This valve extends the range of the company's line of gasket-

mounted units adaptable for traverse and feed circuits, holding vertical loads, and similar applications. This unit (Model 4CG-03) is of the spring-closed poppet type construction. Spring closure design provides uniformly consistent operation regardless of the valve mounting position. The valves can be arranged in control systems to block flow in a given direction until opened by remotely applied pilot pressure, and to allow free reverse flow. The valve has a rated capacity of 8 gallons per minute and is recommended for use in systems with operating pressures up to 2000 pounds per square inch. A pilot pressure greater than 40 per cent of the system pressure is required to open the valve.

Circle Item 154 on postcard, page 245

#### Oakite "Hurriclean" Gun for Steam Cleaning

"Hurriclean" gun, designed for steam cleaning efficiency, cool handling, and easy operation, recently introduced by Oakite Products, Inc., New York City. The



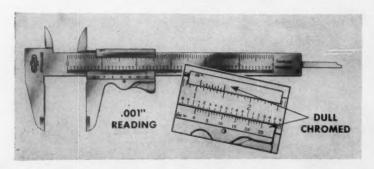
most outstanding feature of this solution-lifting steam gun is the ingenious way in which the cleaning solution is used to protect the operator from the heat. Instead of separate tubes for solution and steam, this gun uses a tube within a tube, steam passing through the insulated interior tube and solution through the exterior tube. The steam loses none of its heat, but the cleaning solution reduces the external temperature of the gun. The solutior is automatically

#### Mauser Stainless-Steel Vernier Caliper

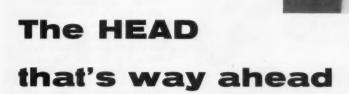
Dull-chrome finished vernier slides are the latest improvement in the Mauser vernier caliper as announced by the George Scherr Co., Inc., New York City. This vernier caliper, known as No. 101, was recently changed to all stainless steel, making it rustproof

against atmospheric conditions or perspiration. The dull-chrome finish on the scales eliminates glare and reflection given off by ordinary bright steel, resulting in faster and more accurate readings and measurements.

Circle Item 153 on postcard, page 245



The Prescheduling Chart plans the sequence of operations . . . charts the proper speeds and feeds . . is a permanent record of each tool diameter, speed and feed. Speed Dial - Preselects any one of 36 speeds while machine is in operation shift is automatic at and of each operation.



... brings you 3 outstanding performance features!

The concentration of complete control of all speeds and feeds by two easily read dials on the head is an outstanding advance in design.

time - insures controlled correct operation - and is easy for the operator.

Hydraulic shift for speeds and feeds is quiet and positive. All mechanism for preselection

high productivity.

Feed Dial-Preselects any one of 18 feeds for next

tool while machine is in operation - shifting is quiet and direct.

interested in the many new features.

is contained in the head. These ultra modern Super Service Radials have many other advanced features - for easy handling and

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#### THE CINCINNATI BICKFORD TOOL CO.

Subsidiary of GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin.

Cincinnati 9, Ohio, U.S.A.

drawn into the nozzle of the gun by the partial vacuum created by the steam passing through. Another feature of the new gun is the sealed rotary joint which makes it possible to rotate the nozzle without twisting or wrestling with heavy solution or steam hose. While the forward end of the gun can be revolved to clean at any angle, the handle and hose connections remain stationary. The thrust of the steam is taken up between the handles. The gun is precision-made, with a cast-aluminum spade type rear handle, cast-brass valves, stainless-steel outer and inner tubes and nozzle, and an oil-resistant forward rubber grip. It weighs 6 3/4 pounds in its 3 1/2-foot length, and slightly more in the 5-foot size.

Circle Item 155 on postcard, page 245

#### Manco Dimpler with Adjustable Heat and Thrust Ranges

The Manco Mfg. Co., Bradley, Ill., has announced the development of a mobile, hydraulic dimpling machine. This unit has a dimpling capacity range from size 3/32-inch rivets up to 3/8-inch screws for Alclad aluminum from 0.020 to 0.102 inch in thickness. It also features easy adjustment of the thrust and heat ranges. A thrust range of 0 to 15,000 pounds, adjustable in 100-pound increments, can be obtained for preforming operations. For final forming the



thrust range is 0 to 20,000 pounds in 150-pound increments. A heat range of 0 to 750 degrees can be obtained for hot dimpling. An automatic heat timer, adjustable up to 15-second intervals, permits maintenance of the desired heat and its proper disbursement.

Circle Item 156 on postcard, page 245

#### **Carmet Throw-Away Inserts**

Throw-away tool inserts from the complete line brought out by the Carmet Division of Allegheny Ludlum Steel Corporation, Detroit, Mich., for use in mechanical tool-holders. These blanks are available in both precision-ground



and utility styles, ground top and bottom. They are made in Carmet's new "600 Series" steel-cutting grades, as well as in those grades recommended for machining cast iron and non-ferrous metals. These blanks, available in twelve different sizes, are made in round, square, and triangular shapes.

Circle Item 157 on postcard, page 245

#### **Turntable Heating Unit**

A unit designed to facilitate brazing, soldering, annealing and hardening operations is announced by Gas Appliance Service, Inc., Chicago, Ill. Parts to be heated are held by fixtures attached to the power-driven turntable and passed between two rows of burner nozzles. The amount of heat required is controlled by a valve adjustment on the burner manifold, and the heating time can be regu-



lated by a variable speed drive on the turntable. The burner manifold can be moved vertically or horizontally. The burner nozzles are mounted on flexible copper tubing which is adjustable to suit various types of work.

Circle Item 158 on postcard, page 245

#### Micrometer Caliper with Cam Lock

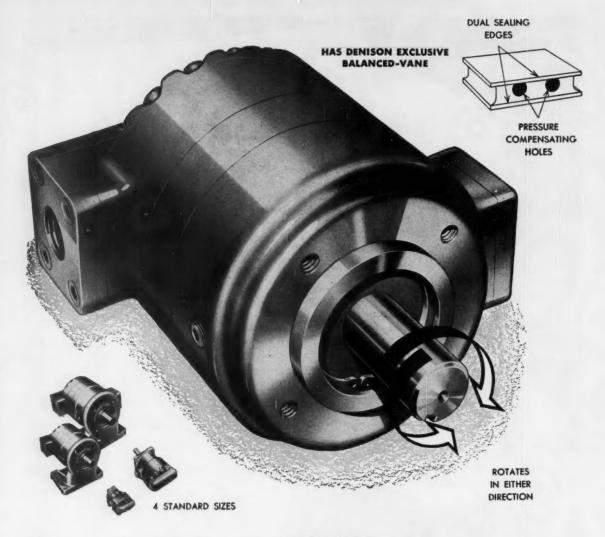
A micrometer caliper with a cam lock has been announced by the Lufkin Rule Co., Saginaw, Mich. The cam lock is easy and fast to operate, and holds the spindle securely. A one-eighth turn locks or unlocks the spindle. The cam lock replaces the lock-nut on current production of Series 1600 and 1900 Lufkin micrometer calipers at no additional cost.

Circle Item 159 on postcard, page 245

(This section continued on page 238)



#### March 19-23 See the Blue Ribbon Winners of 1956 The 453 selected TOOLING CHAMPIONS plus 27,898 runners-up The best and latest in tools, machines, inspection equipment, automation devices, controls and accessories to cut costs and boost profits—many never before shown anywhere. For the small plant For the intermediate plant For the big plant See them at AS7E's Greatest Show Sponsored by the 32,000 men responsible for designing and selecting the best in production equipment. Write for advance registration blank today. Equally important, plan to attend the 5-day, all-industry conference covering the latest developments in manufacturing techniques and equipment. AMERICAN SOCIETY OF TOOL ENGINEERS Detroit 38, Michigan



#### for continuous 2000 psi service...

### Vane type Denison hydraulic single stage, Pump/Motor

IT'S A PUMP—high delivery in a small, compact package . . . a continuous 2000 psi pump.

IT'S A MOTOR-high stalled torque up to 257 pound-inches per 100 psi. Takes high shock pressures without danger.

**EXCLUSIVE**—Denison Radially Balanced Vane; Cuts wear between cam ring and vane; Increases efficiency with dual sealing edges; Reduces pulsation by radial pumping action of vanes.

#### SIMPLIFIES INVENTORY

No need to stock separate pumps and motors. Runs as a pump or motor without alterations. Range of capacities in each size through interchangeable cam rings.

EITHER DIRECTION—Operates efficiently as a pump or motor without change in piping. Minimum internal friction in either direction because of greatly reduced contact pressure between vanes and cam ring.

STANDARD SIZES—as a pump, Range of delivery 2.5 to 77 gallons per minute at 2000 psi. As a motor, Horsepower output 1 to

**MORE INFORMATION**—Send for Bulletin P-5-A giving complete specifications. Write . . .

THE
DENISON ENGINEERING COMPANY
1244 Dublin Road • Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.



HYDRAULIC PRESSES . PUMPS . MOTORS . CONTROLS

103 hp at 2000 psi.

#### AMERICAN STANDARD MACHINE PINS-2

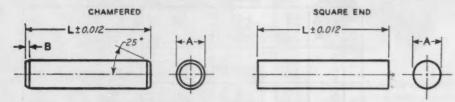


Table 2. Dimensions of Straight Pins

Nominal Diameter	Diar	neter	Chamfer B	
Diameter	Mar.	Min.	В	
0.062 0.094 0.109 0.125 0.156 0.188 0.219	0.0625 0.0937 0.1094 0,1250 0.1562 0.1875 0.2187	0.0605 0.0917 0.1074 0.1230 0.1542 0.1855 0.2167	0.010 0.010 0.010 0.010 0.010 1/64 1/64	
0,250 0,312 0,375 0,438 0,500	0.2500 0.3125 0.3750 0.4375 0.500	0.2480 0.3095 0.3720 0.4345 0.4970	1/64 1/32 1/32 1/32 1/32 1/32	

All dimensions are given in inches.

These pins must be straight and free from burrs or any other defects that will affect their serviceability.

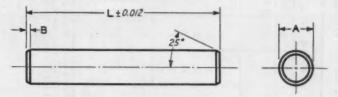


Table 3. Dimensions of Ground Dowel Pins

(Not Hardened)

Nominal Diameter	Dian	neter	Chamfer B
Damie	Max.	Min.	В
0,062	0.0600	0.0595	0.010
0,094	0.0912	0.0907	0.010
0,109	0.1068	0.1063	0.010
0.125	0.1223	0.1218	0.010
0.156	0.1535	0.1530	1/94
0.188	0.1847	0.1842	1/94
0.219	0.2159	0.2154	1/94
0.250 0.312 0.375 0.438	0.2470 0.3094 0.3717 0.4341	0.2465 0.3089 0.3712 0.4336	1/44 1/52 1/52 1/52 1/32
0.500	0.4964	0.4959	1/52
0.625	0.6211	0.6206	3/64
0.750	0.7458	0.7453	3/64
0.875	0.8705	0.8700	1/16
1.000	0.9952	0.9947	4/16

All dimensions are given in inches.

Maximum diameters are graduated from 0,0005 on 1/16 in. pins to 0,0028 on 1-in. pins under the minimum commercial bar stock sizes.

Extracted from ASA B\$.20-1954 with permission of publisher, American Society of Mechanical Engineers

# AMERICAN STANDARD MACHINE PINS-3



Pins
of Taper
o o
Dimensions
4.
Table

Number	0/4	0/9	2/0	4/0	3/0	2/0	0	1	2	3	4	10	9	7	80	0	10
Size (Large End)	0.0625	0.0780	0.0940	0.1090	0.1250	0.1410	0.1560	0.1720	0.1930	0.2190	0.2500	0.2800	0.3410	0.4090	0.4920	0.5910	0,7060
Length, L																	
0.375	×	×						-	-	-1	1	1 2 2 2			-	-	
0.500	×	×			×	×	×		1			1	1			1	
0.625	×	×	×	×	×	×	×						1 1		-	1	
0.750		×	×	×	×	×	×	×	×	×	-	1	-	1 1			
0.875	1		1	-	X	×	×	×	×	×			1		-		
1.000	4 1 1	1 1	×	×	×	×	×	×	×	×	×	×					
1.250		1				×	×	×	×	×	×	×	×		1		
1.500	1	-		-			×	×	×	×	×	×	×	1	1	1	
1.750	1							×	×	×	×	×	×				
2.000	111	1					1 1 1	×	×	X	X	×	×	×	×		
2.250	1		1			1 1		1 1	×	×	×	X	×	×	×		
2.500	1								×	×	×	×	×	×	×		
2.750										×	×	×	×	×	×	×	

Fins Nos. 11 (size 0.8600), 12 (size 1.032), 13 (size 1.241), and 14 (1.523) are special sizes—hence their lengths are special. To find small diameter of pin, multiply the length by 0.02083 and subtract the result from the large diameter. Standard reamers are available for pins given above the line. All dimensions are given in inches.

(\* 0.0030) 0.0005 up to 1 in. long 0.001 11/1s to 2 in. long 0.002 21/1s and longer 7/0 to 10 (+ 0.0013, -0.0007) PRECISION TYPE COMMERCIAL TYPE Sizes Tolerance on Diameter Taper Length Tolerance Concavity Tolerance TYPES

7/0 to 14 (+0.0013, -0.0007) 1/4 In. per Ft. (=0.030) None

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There's a first-cost advantage when your Bor-Dril operation can be done on a Standard Ex-Cell-O Machine. This Style 112-D Precision Boring Machine is Bor-Drilling 14 holes from the solid on the part shown above.

Short Cut in Long Hole

## EX-CELL-O METHOD



Bor-Dril is a new cost-reducing way to drive gun drills. It makes possible high production with accuracy on long holes from solid, maintaining finish size. Also it finishmachines cored holes in castings in one operation. Since its recent introduction by Ex-Cell-O, Bor-Dril is saving money on many newly developed applications. Range of hole sizes is large, and the process takes widely varied sizes and shapes of parts made of steel, cast-iron, bronze, aluminum, magnesium and titanium. For more information on Bor-Dril, or for a quotation on a machine equipped for this work, call in your local Ex-Cell-O Representative or contact Ex-Cell-O in Detroit.

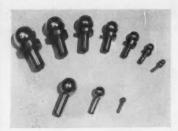
#### EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS

- GRINDING SPINDLES
- CUTTING TOOLS . RAILROAD PINS AND BUSINIGS . DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS .

  - DAIRY EQUIPMENT



#### Tooling Balls with Plain Shanks and with Reference Shoulders

Tooling balls that have shanks both with and without locating shoulders announced by Industrial Tectonics, Inc., Ann Arbor, Mich. These items are made of Type 440-C stainless steel for protection against corrosion and are hardened to 55-58 Rockwell C. Both types are carried in stock in ball sizes ranging from 1/4 inch through 1 inch by increments of 1/8 inch. Balls with a plain shank are called fixture balls and are generally built into jigs and fixtures, where the center of the ball provides a positive locating point for positioning work in any plane. These balls are accurate to plus or minus 0.0001 inch on size, the shanks are held to plus 0.0000 inch and minus 0.0003 inch on the diameter, and the ball and shank are concentric to within 0.0002 inch total indicator reading. The balls with a reference shoulder (known as checking balls) are used for inspection purposes, and the distance from center of ball to bottom of shoulder is held to plus or minus 0.0002 inch. The balls are made to plus or minus 0.00002 inch on size, the shanks

are held to plus 0.0000 inch and minus 0.0002 inch on the diameter, and the ball and shank are concentric to 0.0002 inch, total indicator reading.

Circle Item 160 on postcard, page 245

#### Whitman & Barnes Hercules Cobalt High-Speed Drills

Whitman & Barnes, Division of United Drill and Tool Corporation, Plymouth, Mich., recently announced the addition of a complete series of Hercules cobalt high-



speed drills to its regular line of drills, reamers and carbide tools. Designed to serve as a medium between regular high-speed steel drills and carbide drills, they are said to give improved performance in materials having inherent work-hardening qualities such as stainless steels, manganese steels, armor plate, silicon-chromium, and valve steels. Hercules cobalt high-speed drills are available with straight or taper shanks and in a complete range of fractional, jobber, letter and wire gage sizes. Circle Item 161 on postcard, page 245

#### "Rumco" Centrifugal Pump

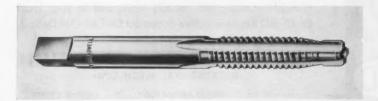
Centrifugal pump of 1/20 H.P., designated as "Rumco" Model D-500, developed and manufactured

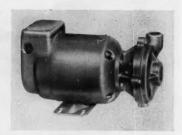
#### Threadwell Piloted Tap

The Threadwell Tap & Die Co., Greenfield, Mass., has introduced high-speed, ground-thread, piloted taps for general use. Originally designed for service in tool and die shops, these piloted taps assure the tapping of threads in alignment with the drilled hole. They eliminate the need for fixtures and

may be used in hand or power tapping operations. Tap kits contain five fractional sizes from 1/4 to 1/2 inch in 1/16-inch increments or machine screw taps Nos. 6, 8 and 10. They are available in National Coarse or National Fine pitches.

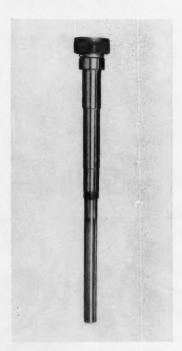
Circle Item 162 on postcard, page 245





by Ruthman Machinery Co., Cincinnati, Ohio. This unit, equipped with a self-adjusting pre-tested seal, is designed for use in closed, semi-closed, or open systems, and can be mounted at any convenient point, either in a horizontal, vertical, or angular position. It is very compact and simple in construction, and is available in either cast iron or bronze.

Circle Item 163 on postcard, page 245



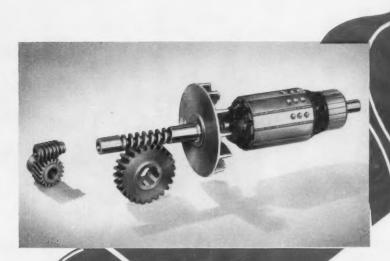
#### "Kwik-Switch" Spindle for Bridgeport Heads

Universal Engineering Co., Frankenmuth, Mich., has brought out a "Kwik-Switch" spindle for Bridgeport milling heads. The spindle reduces time lost in tool changing on multiple machining operations. Construction features are maximum rigidity with minimum overhang and elimination of the need for a draw-bar. The spindle is

(Continued on page 242)



#### 40 Years of Specializing in Small Gearing!



## Copers of All Kinds Serve Longer and Store Dependant, with G.S. Gearing

makers have the client year in and year out by the makers have the product of the makers have the customers are manufacturers of top quality have clippers for barbers, hedge trimming, animal the ling and others. Extreme uniform G.S. accuracy is a rand equirement to assure the purring performance and lamber life of these very successful products.

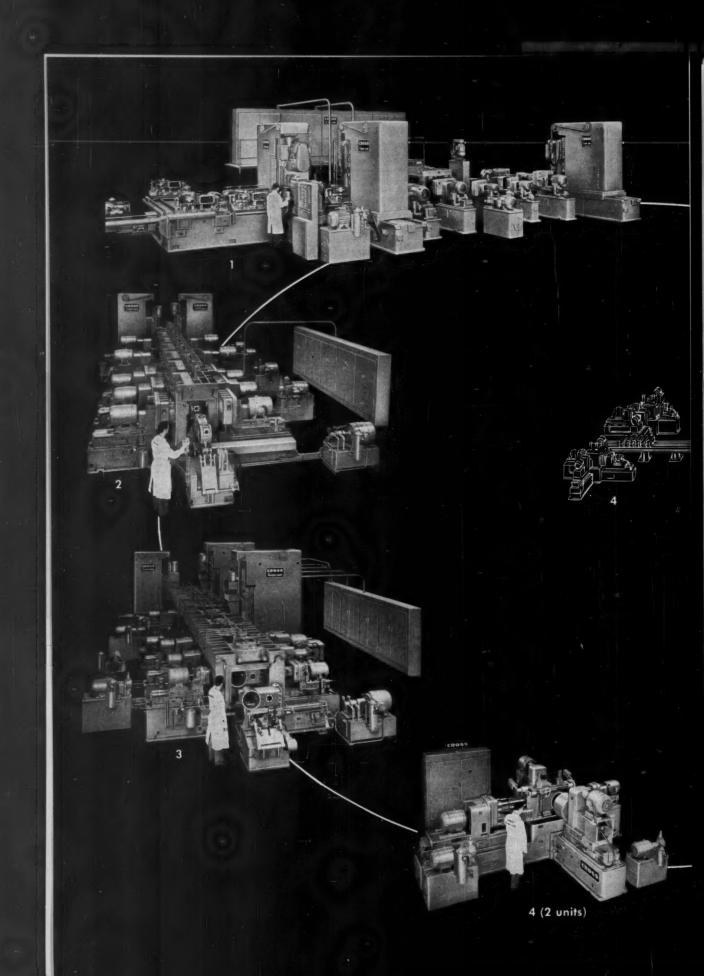
If transpatting power is involved in the products you make, chances are we can help you, too! Remember please, we've specialized on the design and quantity production of Small Gearing, from 8 to 96 dp, for more than 40 years. Through never ending research.. the development and perfection of men, methods and machines.. we've reached a position of leadership in this field! Specifying "G. S." is your guarantee of getting Small Gearing that consistently measures up to the most exacting specifications. Will you tell us just how we can best serve you NOW?

SEND FOR FREE 6-page Small Gearing Guide. It describes 80 types and applications. Contains useful charts..a valuable aid to anyone interested in Small Gearing. Use company letterhead, please. No obligation, of course. Write today!

YOU'LL FIND G.S. GEARING IN TOP OUALITY PRODUCTS LIKE THESE..

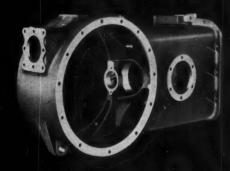
Aircraft Carburetor & Fuel Metering Systems • Aircraft Instruments & Radios • Automatic Musical Instruments • Business Machines • Communication Equipment • Electric Fans • Electric Motors • Floor Polishers, Scrubbers & Sanders • Food and Drink Mixers • Home Appliances • Meat Tenderizers, Grinders & Slicers • Military Equipment • Motion Picture Equipment • Outboard Motors • Pneumatic Production Tools • Portable Electrical Tools • Radio Dials • Sewing & Cloth Cutting Machines • Steelstrap Stretchers • Step Switches • Vending Machines.





More Sectionized Automation by Cross

Tractor
Differential Housings
from Rough Castings
to Assembly!



0 00

- \* 46 pieces per hour at 100% efficiency.
- \* 225 foot Sectionized (segmented) Transfer-matic of 4 sections.
- ★ 313 operations: 19 milling, 7 cross-facing, 110 drilling, 17 boring, 72 chamfering, 4 spot-facing, 8 reaming and 76 tapping.
- All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- Other features: Construction to JIC standards; hardened and ground ways; automatic lubrication; hydraulic feed and rapid traverse except tapping; individual lead screw for tapping.

Established 1808

THE CROSS

First in Automation

DETROIT 7, MICHIGAN

available for 1/2-H.P. heads with No. 2 Morse and No. 7 B & S noses, and 1-H.P. heads with R-8 collet noses.

Circle Item 164 on postcard, page 245



#### Logan "Ultra-mation" Heavy-Duty Cylinders

The Logansport Machine Co., Logansport, Ind., has announced a new line of non-rotating, doubleacting, square - end cylinders. These "Ultra-mation" cylinders, previously built only on special order for unusually difficult highproduction jobs, are now available as a regular product of the manufacturer. Basic specifications are as follows: five bore sizes, from 2 to 6 inches; air pressures up to 150 pounds per square inch, and oil pressures up to 500 pounds per square inch; five basic mounting styles—foot, trunnion, flange, clevis, and pivot—with interchangeable covers permitting multiple mounting combinations; covers of heavy steel plate for both front and blind end; extra heavy piston-rods to carry high impact loads, which have highly polished surfaces to assure minimum friction and maximum packing life: rod wipers of durable synthetic rubber; hard-drawn and corrosion-resistant cylinder tubes; pistons of high-quality steel construction; ports of adequate size, which are unobstructed and can be relocated to any 90-degree position by rotating cylinder covers; and extra heavy tie-rods. Cushioning is available for either or both cylinder ends. Cushioned or noncushioned cylinders have same mounting dimensions.

Circle Item 165 on postcard, page 245

Research directed toward adapting aluminum to high-temperature conditions has resulted in a new alloy described as offering excellent properties at temperatures ranging from 500 to 600 degrees F. Aluminum Co. of America, Pittsburgh, Pa., has made the alloy available in experimental quantities.

#### **Machining Magnesium Alloys**

Magnesium alloys are considered to be the easiest of all metals to machine. The power required to cut these alloys at a given rate of feed is only one-fourth to onesixth that required for an equivalent cut in mild steel. This low power consumption results in less heat generation, so that magnesium alloys can be machined at extremely high speeds and feeds without damage to the cutting tools. In practice, cutting speeds are usually limited to the capabilities of the machine, although on close limit operations thermal expansion of the work-piece may necessitate reduced speeds. Feeds are limited only by the finish required. Magnesium-alloy chips are easily broken so that relatively little chip ejection difficulty is encountered.

Clearance angles on tools for machining magnesium should be fairly high to minimize pick-up and generation of excessively wide flank wear lands. Often a hardcase surface treatment may help to reduce these conditions. Polished tool surfaces will also decrease pick-up.

Coolants are generally used in high-speed machining of magnesium alloys to dissipate the heat generated and to prevent ignition of any relatively thin chips. Coolants should always be mineral oils with a high flash point. Watersoluble oils or emulsions should never be used, since water will intensify chip fires that may be started accidentally. Water also reduces the salvage value of the chips.

The following suggestions have been made by the National Twist Drill & Tool Co. for machining operations on magnesium alloys.

Milling—Coarse-tooth helical milling cutters with polished tooth faces are recommended. The rake angle should be 10 to 15 degrees and the clearance angle, 6 to 10 degrees. Fairly heavy feeds should be used, ranging up to 0.025 inch per tooth for roughing operations. Speeds as high as 3000 surface feet per minute are common.

Drilling — Standard polished flute drills, with a lip clearance angle of 12 to 15 degrees, can be used for ordinary hole depths. Rounding or chamfering of the drill will produce accurate, smooth holes and promote long tool life.

For thin sheet drilling, a slow spiral drill with an included point angle of 60 degrees and rounded corners should be used. Deep holes require fast spiral drills with wide polished flutes and parallel webs to facilitate chip ejection. Such drills produce exceptionally deep holes without withdrawal to clear the flutes. Drills must be sharp to prevent rough, under-size holes, and speeds of 75 to 2000 surface feet per minute should be used.

Reaming — Coarse-tooth reamers with either straight or slow left-hand spiral polished flutes are recommended. The cylindrical land should be narrow (0.005 to 0.010 inch) to minimize pick-up and rough hole surfaces. Reamers with no cylindrical land may be used but this causes difficulty in maintaining hole size. Hard-case surface treatments are often desirable, and speeds for reaming should range from 100 to 400 surface feet per minute.

Tapping—Hand taps of a standard design with a hard-case surface treatment perform well in magnesium alloys. Speeds of 50 to 200 surface feet per minute may be used, but most tapping operations are run at about 100 surface feet per minute.

#### Orders for Dies, Fixtures, Jigs, and Special Machinery Turn Upward

Tooling for 1957 models of automobiles has already resulted in a definite and widespread upturn in orders for special dies, jigs, fixtures, molds, and special machinery, according to a recent report of the National Tool & Die Manufacturers Association. It is expected that 1956 will set a new record in value of shipments in the categories mentioned of well over \$750,000,000.

#### Transistors Replace Tubes in Automobile Radio

An experimental transistorized automobile radio, operating directly from a 6-volt battery and requiring about one-tenth the power used by a conventional car radio, has been developed at the RCA Research Laboratory, Princeton, N. J. The radio employs nine transistors instead of vacuum tubes.



ATHES

outstanding in R great requirements

which are indispensable in furnishing amazing speeds on work of utmost precision . . . LOWEST COST PER PIECE.

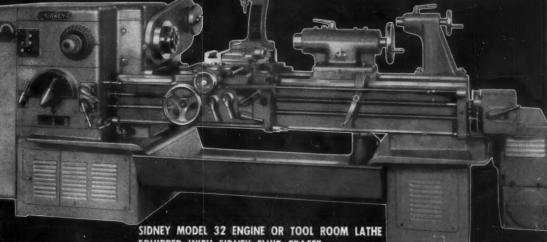
- 1) GREATER RIGIDITY
  - 2 SIMPLICITY of CONTROL and OPERATOR CONVENIENCE 3 PRODUCTIVITY

. PRACTICAL . . . DEPENDABLE . . . DESIGNED to do MORE for you at LESS COST. Built on the fundamental SIDNEY principles which have won international fame

since 1904 . . . improved to satisfy

the demand of the present

and far into the future.



EQUIPPED WITH SIDNEY FLUID TRACER

THE SIDNEY MACHINE TOOL CO. . SIDNEY, OHIO

Bullders of Precision Machinery since 1904



RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

## The Proper Loading of Bolts

The pre-load, or residual tension, in a tightened bolt means more to assembly strength than the actual strength of the bolt itself.

In a joint, a bolt torqued to its proper load level resists a maximum amount of external load without loosening. Designers can take advantage of this fact and assure better results, and at the same time, cut costs.

For example: One designer calculated that truck frames needed high strength bolts at least ½" in diameter. So he used 5%". But on the assembly line, these were being torqued to 100 ft.-lbs. whereas they needed at least 200 ft.-lbs. for proper residual tension. The ½" bolt at 100 ft.-lbs. would actually have given the stronger assembly and at less cost.

In another case, the bucket on earth moving equipment was always coming loose. The design engineer kept increasing the size of the bolt up to 1½", but to no avail. The impact wrench used was supplying far too little torque for this size. We suggested a return to the original ¾" bolt used, set up to 350 ft.-lbs. torque. It solved the problem.

In short, the more you stress a bolt within its elastic limit, the greater its ability to stay tight and make a strong assembly.

## Symmetrical flow lines assure strong bolt heads



Photo of perfect cold worked blank after first upset.



Effect of improper forming is a poor head like this.

In the manufacture of bolts and cap screws, the first upset of metal is a vital one. It determines the flow lines in the bulb which will form the head. A symmetrical flow assures no laps and, therefore, no weak spots or cracks in the final upset of the head.

#### MACHINE OPERATOR'S SKILL VITAL

The upper photo shows a longitudinal section of a blank after the first upset and on its way to becoming an RB&W standard bolt. Note the even distribution of flow lines. This bulb will become a perfect head.

The lower photo shows what can happen with poor tools, inexperienced operators or without precision setup of the cold headers. Note how pronounced is the unbalanced flow pattern which resulted from a bulb with just a minute defect.

#### DEPENDABLE FASTENERS

Cap screws and bolts also get a bright smooth finish from the right kind of cold forming. But above all, they offer the designer low cost fasteners with sound internal structure. Standard RB&W fasteners can be loaded to their proper level—become a strong point in any assembly.

For help on your fastener problem, contact Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

## The Only Screw That Stays Tight

The continual heating and cooling caused loosening of handle screws on the flat irons of one manufacturer. Every type tried failed to stay tight until RB&W's unique Spin-Lock tapping screws were used. This solved the problem. Their hardened teeth lock into the surface, require more torque to loosen than to tighten. One piece fasteners, they speed assembly time.



## PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On New Shop Equipment described in the editorial pages
On products shown in the advertisements

### **NEW CATALOGUES**

TRACING TEMPLATES—Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio. Portfolio containing 48 tracing templates 8 1/2 by 11. Prepared scale full size, the templates are available for tracings of all sizes of the company's strap clamp assemblies, malleable and aluminum hand knobs, speed handles, speed bar knobs, revolving clamp assemblies and swing clamp assemblies. In addition the portfolio contains an angle chart giving formulas for finding functions of angles and a chart showing decimal equivalents of standard drill sizes. Printed on transparent tracing paper, the complete portfolio can be obtained free of charge by writing to the above concern on company letterhead.

PRODUCTION WELD TOOLING—Pandjiris Weldment Co., 5152 Northrup Ave., St. Louis 10, Mo. 28-page catalogue on production weld tooling. The catalogue contains application photographs of equipment used in most steel fabricating industries—construction, railroads, tank, pipe, automotive, ordnance, heating, shipbuilding, farm equipment, and transformers. Catalogues obtainable upon request on company letterhead to the above concern.

ELECTRIC WELD TUBE MILLS—Yoder Co., Cleveland, Ohio. 64-page catalogue containing a brief review of the different tube-making processes; and a more complete description of the cold-forming electric weld process, its development, possibilities and limitations. Data is given on the cost of such mills, operating cost, speed, production, and minimum tonnage or footage requirements for profitable operation. One chapter on the design and construction of the welding transformer gives the most recent achievement in welder design—the four-in-one cross type transformer. A single core is enveloped by the four transformers so that the flux patterns in the four sections are identical. Specifications and illustrations of the different units comprising the complete mills and their engineering data are given.

JET BLADE PROFILING MACHINES— Ex-Cell-O Corporation, Detroit, Mich. Bulletin 50620-A, giving information on precision machining of jet-engine compressor and turbine blades. Profile milling, grinding, and polishing are described in the text, and pictures show typical applications of these operations. The se-

PUNCHING AND NOTCHING EQUIP-MENT—Punch Products Corporation, Niagara Falls, N. Y. Catalogue describing the company's Unipunch Series A perforating units for press and press brake set-ups. Round or shaped holes can be punched in sheets or angles up to 1/4-inch thick. The complete line has an 8 3/8-inch shut height and a 3 1/2-inch die height. Series B units punch round and shaped holes in metal up to 1/8-inch

thick and have a 5 1/2-inch shut height with 2 19/32-inch die height. This series is designed for presses having relatively small strokes that cannot accept the 8 3/8-inch shut height of Series A units.

CARBIDE GRADES—Adamas Carbide Corporation, Kenilworth, N. J. 4-page booklet describing the company's complete line of tungsten-carbide grades. Divided into four sections, this booklet covers straight carbide grades for machining cast iron, non-ferrous and non-metallic materials; steel-cutting carbide grades; carbide for die applications and special-purpose grades, including some of the newer carbide grades used in mining and rock-drilling applications. Included are also physical and chemical data on each of the grades, together with chemical analysis of some types of Adamas materials.

PRESSES—E. W. Bliss Co., Canton, Ohio. 32-page catalogue 11B, describing six basic types of presses ranging from 200 to 2500 tons—two 4-point single-action presses, a 4-point single-action underdrive press, and a 4-point triple-action underdrive press. Described also are such specialized features as new automatic lubrication systems, integral gear and eccentric units, motorized slide and blank holders, built-in die area lights, flushmounted air and electrical controls for operation of auxiliary press equipment. Complete specifications and dimensions are given.

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New York, N. Y.

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DEEP-THROAT PRESSES—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 61C, describing the company's new line of deep-throat presses. Information and specifications are given for the complete range of 22- to 150-ton capacity presses which feature a front-to-back crankshaft design and enclosed driving mechanism. Also described and illustrated are other press features including electropneumatic clutch and air-releasing brake, box type welded steel frames, adjustable air counterbalance, automatic lubrication, operating controls and press accessories.

PRECISION SURFACE GRINDERS—DoAll Co., Des Plaines, Ill. 24-page catalogue describing a variety of precision surface grinders for tool-room and production grinding operations. Among the models described is the company's D-6 grinder now available in a considerably larger work area, and the D-10 model with an area of 10 by 30 inches yet retaining small grinder precision. Also illustrated and described are numerous optical accessories and features for extending the

application of surface grinders and improving efficiency and speed of operations

HEAVY-DUTY LATHE—Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif. 20-page bulletin 5504-L-2N, describing the company's 32-inch, heavy-duty lathe. Twelve important features are presented and illustrated in detail. The bulletin also points out the various spindle speeds which are in true geometric progression. Operation, maintenance, controls, range of feeds and leads, power unit, micrometer cross-feed positive stop, follow-rest, steadyrest, and drive-plate are described. . . . . . . . . 10

DRILLING AND TAPPING MACHINE—Edlund Machinery Co., Cortland, N. Y. Bulletin 170, describing the 4F, heavy-duty drilling and tapping machine with advanced design features such as infinitely variable speeds to 2000 R.P.M., standard equipment back gear, and extra heavy ribbed table and pedestal for long-run production rigidity and accuracy. The machine is available with power production accessories such as the Edund lead-screw tapper, reversing motor tapper, and semi-automatic power feed.

CAN TESTERS—E. W. Bliss Co., New York, N. Y. Catalogue 36B giving information on the complete lines of both automatic and hand-operated can testers. Illustrated and described are air testers for high and medium speed lines, air testers for larger-sized cans, a tester for five-gallon petroleum and similar cans, and a line of hand-operated testers and detectors. The catalogue describes

STEP DRILLING UNITS—Ex-Cell-O Corporation, Detroit, Mich. 20-page bulletin describing quill type hydraulic power units and their use in step drilling and other machining operations. Detailed description of the work-process is given. The bulletin shows four sizes of these units for feeding and rotating cutting tools. Incorporated in special machines they are used for drilling, spot facing, counterboring and reaming operations.

SELENIUM RECTIFIERS—Hanson-Van Winkle-Munning Co., Matawan, N. J. Bulletin ER-107 describes and illustrates the H-VW-M Selenium Rectifiers for electroplating, anodizing and related processing. The bulletin lists construction, electrical and controlled features of this rectifier. Also included are specifications of standard bench, self-contained, and remote controlled types of rectifiers. . 14

COPPER AND COPPER ALLOYS—Revere Copper and Brass, Inc., New York, N. Y. Catalogue giving technical information on copper and its alloys. Divided into the following sections: quality and service, coppers, brasses, bronze alloys, nickel alloys, special products, welding techniques, and condensed list of products. The booklet gives detailed information and illustrations on the above chapters.

COMPRESSION SPRINGS — Hunter Spring Co., Lansdale, Pa. 16-page bulletin presenting preliminary design data for the Flex ator compression springs. Subjects discussed include the characteristics and properties of the spring, materials, types of ends, methods of mounting, design formulas, and design standards. Four tabular form design charts, each representing a different fatigue life requirement or stress level are included. 16

INCLINABLE PRESSES—E. W. Bliss Co., Canton, Ohio, Catalogue 3, describing double-crank inclinable presses, including a newly designed line of enclosed double cranks with box type crowns. Specifications for standard and special features are given and complete dimensions are listed. The catalogue also gives detailed descriptions of air-friction and rolling key clutches, cast Meehanite frames, die cushions, and automatic

CARBIDE TOOLS—Besly-Welles Corporation, Beloit, Wis. 12-page booklet 850C, containing charts and descriptions of the company's various types, sizes, and styles of standard and special carbide-tipped tools. In addition to the specific information included on the Besly-Metro products, the catalogue contains data on carbide-tipped tools in general and many illustrations of their proper application.

#### **Product Information Service**

Use postage-free Business Reply Card below for further information on New Catalogues or New Shop Equipment described in this issue and products mentioned in the advertisements.

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CONTROLLED VOLUME PUMPS—Milton Roy Co., Philadelphia, Pa. Bulletin 855, describing a new line of controlled volume pumps for "downhill" metering of liquids and gases. Also given are specifications, capacities, and features of the new unit for "downhill" pumping. Illustrations and descriptive copy show the application of this unit in additive injection, bottle filling, proportional feed and fluid sampling systems. . . . . 20

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GRINDAWAY WHEELS—Colonial Abrasive Products Co., Conshohocken, Pa. Folder describing Colonial reinforced wheels for high-speed, portable grinding, equipped with Grindaway safety rings. These rings are made of a material having a tensile strength greater than steel, which is due to hundreds of continuous minute glass filaments, bundled together and overlapping one another. . . . . . 21

TEMPERATURE CONVERSION TABLE— Thermo Electric Co., Inc., Saddle River, N. J. Two-color chart converting Fahrenheit to Centigrade or vice versa from minus 400 to plus 4000 degrees. Shown are also temperature ranges of various sensing elements — thermocouples, resistance bulbs, and radiation heads. Maximum limits for both continuous and intermittent services are also shown. . . 24

GAGE BLOCKS—Webber Gage Co., Cleveland, Ohio. 36-page catalogue describing the company's gage blocks and accessories. Contains photographs, line drawings, charts, and detailed descriptions of the company's complete line of linear and angular gage blocks and accessories, optical flats, interferometers and temperature meters. Four new additions to the line are also included. . . 25

AIR LINE RESPIRATORS—Mine Safety Appliances Co., Pittsburgh, Pa. Bulletin No. 1009-8 giving information on two basic types of respirators designed for protection in atmospheres not immediately harmful to life such as welding and cutting fumes, toxic dusts, paint spray vapors and fumes from molten metals. 26

HIGH-PRODUCTION PRESSES—E. W. Bliss Co., Canton, Ohio. Catalogue 27C, describing the company's complete line

of high-speed automatic presses, including special features and attachments. Special sections are devoted to Bliss feed mechanisms, special - purpose H-P presses, and typical examples of the work done on H-P presses are included. . . 28

HYDRAULIC TESTING MACHINES—Baldwin - Lima - Hamilton Corporation, Philadelphia, Pa. 12-page bulletin 4401, giving data on Baldwin-Tate-Emery universal testing machines. Hydraulic machines with capacities from 10,000 to 5,000,000 pounds are described, including standard and special types of vertical and horizontal machines. . . . . 29

ALUMINUM BRONZE ALLOYS—W. W. Alloys, Inc., Detroit, Mich. 32-page booklet giving information on the properties, composition, and functions of aluminum bronze alloys as furnished by the company in sand, centrifugal, investment and permanent mold castings, hammer forgings, and machined parts . . . . . 30

BERYLLIUM COPPER STRIP—Penn Precision Products, Inc., Reading, Pa. 12-

PORTABLE AIR TOOLS—Rotor Tool Co., Cleveland, Ohio. Bulletin 53, describing and giving specifications for the company's assembly tools, drills, small wheel

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grinders, straight grinders, vertical grinders, scalers, chippers, and rammers.

FLEXIBLE METAL HOSE—Flexonics Corporation, Maywood, III. 12-page catalogue No. 152, describing the company's complete line of Flexon flexible metal hose. The full range of products is covered along with complete coupling data. An easy four-step metal hose selection 

VENTILATED CLUTCH—Fawick Corporation, Cleveland, Ohio. Bulletin ML-102-A, giving complete description of all sizes of VC clutch elements and applications including complete dimension and capacity data in easy-to-read table

SINGLE-SPINDLE AUTOMATIC MACHINE—Cleveland Automatic Machine Co., Cincinnati, Ohio. Bulletin describing the 1 3/8- and 1 5/8-inch 1 5/8-inch Cleveland Dialmatic with infinitely variable spindle speeds and tool feeds which are completely dial controlled. . . . . . 37

address

TURNING AND CUTTING TOOLS—Diamonite Products Division of U. S. Ceramic Tile Co., Canton, Ohio. Catalogue and price list B giving complete descriptions and specifications of the company's line of turning and cutting

ELECTRICAL FITTINGS — Buchanan Electrical Products Corporation, Hillside, N. J. Bulletin 561, containing illustrated description and price information on the company's complete line of solderless fittings and electrical hardware product

TURRET DRILLS—Burg Tool Mfg. Co., Inc., Gardena, Calif. Bulletin giving specifications of the five Burgmaster turret drill models. Included is also information giving details of the company's "Tool-Flex" line of full floating tool-bleter.

TOOL AND DIE MILLING MACHINES
—The Cincinnati Milling Machine Co.,
Cincinnati, Ohio. Bulletin M1919-1 describing the company's Contourmaster

Style 1A and Style 1B tool and die mill ing machines. .....

MICRO POSITIONER—Micro-Positioner Corporation, Los Angeles, Calif. Folder describing the Micro Positioner, a precision-made automatic indexing table that facilitates reproduction of complex drilling or tapping patterns. . . . . . . . . 42

MIDGET SOLENOID VALVE-Switch Co., Orange, N. J. Bulletin 8314, describing midget size three-way solenoid valve. New explosion-proof approvals and higher pressure ratings are now available for these valves.

WIRE FLATTENING MILLS-Waterbury Farrel Foundry & Machine Co., Water-bury, Conn. 12-page bulletin 731-R giv-ing details on the wide range of two-high wire flattening mills and accessory equipment produced by the company. 44

HYDRAULIC PRESSES—Elmes Engineering Division, American Steel Foundries, 

**DRILLS**—Cleveland Twist Drill Co., Cleveland, Ohio. 36-page booklet describing the company's expanded line of carbide tipped and solid carbide drills, reamers, end mills and counterbores. 46

VERTICAL PRECISION BORING MA-CHINE—Wadell Equipment Co., Garwood, N. J. Folder describing VBM automatic vertical precision boring machine. 

PRECISION TOOLS—Dumore Co., Racine, Wis. Catalogue 55-FL covering the company's complete line of Tool Post grinders, hand grinders, automatic drill-ing equipment, drill grinders, and acces-

VIBRATION HANGERS—T. R. Finn & Co., Inc., Hawthorne, N. J. Folder describing a new line of Finnflex heavy-duty vibration hangers designed to prevent transmission of noise and vibration from suspended equipment. . .

AUTOMATION LIMIT SWITCH-Bliss Co., Canton, Ohio. Bulletin describing the operating features of a new limit switch which electrically controls functions of machine tool and press auxiliary 

DRILLING MACHINES - Cincinnati 

DRILLING AND TAPPING UNITS—Dumore Precision Tools, Racine, Wis. 24-page booklet covering Dumore automatic drilling and tapping units and accessories and precision tools. . .

BAROMETRIC CONDENSERS—Ingersoll-Rand Co., New York, N. Y. Bulletin Form 9012-A, describing barometric steam condensers of the disc-flow and ejector-

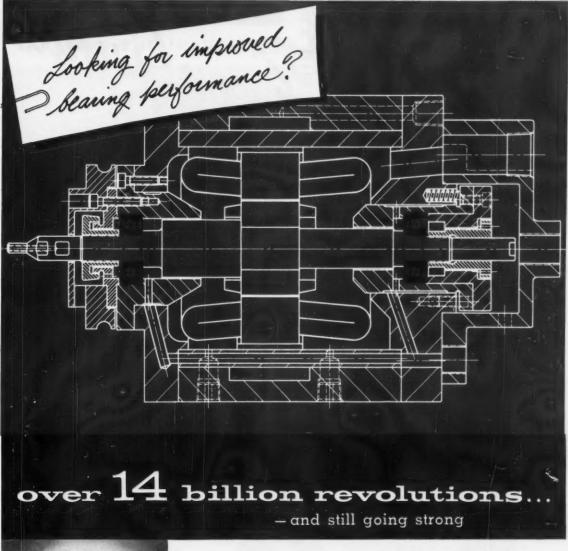
DRILL JIG BUSHINGS—Ex-Cell-O Corporation, Detroit, Mich. New price list 35451, covering Ex-Cell-O ASA standard drill jig bushings. . . . . . . . . . . . . . . . . 54

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55555





Fafnir Super-Precision MM201W1-CR spring-loaded ball bearing, the type specified for wheelhead illustrated.

## Fafnir-equipped, high-speed, oscillating grinder wheelhead demonstrates machine tool progress in performance

This extraordinary record has been made on the production line by a Pope-built wheelhead, grinding the races of extra-precision ball bearings. The hi-frequency motorized wheelhead operates at 72,000 rpm. The motor is water-cooled and bearings lubricated by means of an oil-air mist system.

When designing this oscillating grinder wheelhead, Fafair engineers worked together with the Pope Machinery Company engineers in the selection and application of bearings. The type of bearing recommended is shown at the left and its application in the drawing above. Its performance record, according to Pope, demonstrates progress to match today's improved machine tools.

Whatever your bearing problem, a few minutes spent with a Fafnir representative may be the means of solving it as successfully. Write The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS



MOST COMPLETE LINE IN AMERICA

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-249



## **Buttoning Visitors** with Bows

At the 1956 ASTE Tool Show (March 19-23, Chicago), approximately 480 Blue Ribbons will be distributed to exhibitors before the Show opens. Denham & Co. developed the idea of each company selecting its own highlight on which to pin a Blue Ribbon. The visitor with limited time will be able to immediately spot the latest tool advances among the 28,000-or-so items on display, and then concentrate on equipment of special interest to him.

#### Unsafe to Say

Upon introducing a powerdriven screwdriver, its manufacturer emphasized safety of operation. Our Editor happened to comment to the man about to demonstrate it "No more stubbed fingers?" Whereupon the operator silently raised his right index finger which was covered with adhesive tape.

#### Mobile Messages

In order to accurately drop propaganda pamphlets giant balloons abroad, Minneapolis engineers of the General Mills Mechanical Division worked out a leaflet-carrying system that made use of bicycle wheels, alarm clocks, and razor blades. (What, no bobby pins or desk clips?) The resultant device, which is attached to plastic balloons, has the appearance of a bicycle wheel, 9-pound packets of leaflets being suspended from cords attached to the rim at regularly spaced points. An alarm clock starts two motor-powered razor blades around the wheel, cutting off the cords holding the packets.

### **Roundly Speaking**

In a talk given at the Diamond Jubilee A.S.M.E. meeting. Joseph B. Armitage, vice-president of the Kearney & Trecker Corporation, said, "We speak of things being alike as two peas in a pod, but as far as accuracy goes, we have passed that period many, many years ago. Not just two, but all the balls in a commercial ball bearing are the same size within 0.0001 inch and in precision ball bearings, within 0.00001 inch. But, luckily, we machine tool men are not satisfied: we are continually asking to have them made to closer tolerances, and as they become ever better and finer, the standard of living and the economy will become better and richer." Down on the farm they may still say "like two peas in a pod," but we say "like balls in a bearing."

INTRODUCING G. E. BRUM-BACH, who is the author of the article published in January MACHINERY entitled "Knowledge of Decarburization Dangers Safeguards Tool and Die Performance." Gremlins, particularly active during the holiday season, ganged up on our staff and were responsible for the omission of the author's name. So now we would like to tell our readers something about Mr. B. He was graduated from Lehigh University in 1933 with a B.S. degree and since then has been continuously employed by the Carpenter Steel Co., Reading, Pa. In his earlier

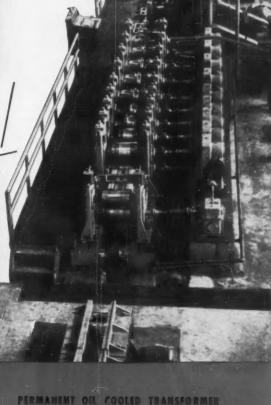


years, he was engaged in mill control, mill processing, and experimental work. For the last fifteen years, he has been in charge of customers' service and development work. Mr. Brumbach is active in the American Society for Metals (in fact, was chairman of the Lehigh Valley Chapter in 1942-43) and also gives talks to many of the technical societies throughout the country. And, yes, he writes articles on tool steels and their heat-treatment which appear in technical publications such as MACHINERY. See our January number, pages. 138 to 141

LEADING THE INDUSTRY IN

# JBE MILL **FEATURE** UNIVERSAL DRIVE

You'll notice a trend toward Etna's modern machine design. Etna has sold other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and facture of one diameter tube to another.



For greater efficiency an Oil Cooled Transformer is incorporated into the machine. It is a permanent unit and never has to be replaced. Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills Built for continuous operation. Write for complete details.

Abbey

Company 3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-251

# news

#### Illinois

W. Sheridan Huss has been appointed president of Acme Steel Products Division, Acme Steel Co., Chicago, Ill. He succeeds John G. Bucuss, who has retired but will continue with the company in an advisory capacity. Mr. Huss joined the company in 1919 and became a salesman in the Detroit sales district. Later he was appointed manager of the central sales area. In 1952 he was named manager of the southern sales area. Last January he was appointed vice-president and general sales manager.

THOMAS J. MOORE, JR., has been appointed director of purchases for the La Salle Steel Co., Chicago, Ill. In addition to purchasing, he will direct material and production planning.

DREIS & KRUMP MFG. Co., Chicago, Ill., announces the following appointments: A. J. DEWOLF was elected president and treasurer, succeeding his father-in-law, Walter H. Dreis, who died recently. Mr. DeWolf has been with the company since 1945 in various capacities and recently as vice-president and general sales manager. Also elected were the following: EDWARD J. DREIS, first vice-president; MATT KRUMP, second vice-president; GART WINKLER, secretary; and MARGARET FREIDHOF, assistant secretary.



A. J. DeWolf, newly elected presidenttreasurer of Dreis & Krump Mfg. Co.

CHICAGO-LATROBE TWIST DRILL WORKS, Chicago, Ill., announces the following appointments: A. E. BALD-WIN joined the sales and engineering staff in the Southwest territory. Andrew Welch has been appointed sales and service representative, covering the Hartford metropolitan and southern New England territories. John R. Roberts will join headquarters in Chicago and travel through the Midwest in addition to the Chicago metropolitan territory.

JOSEPH M. DOROCKE has been appointed general sales manager of Kling Bros. Engineering Works, Chicago, Ill.

#### **New England**

VAN NORMAN MACHINE Co., subsidiary of Van Norman Industries, Inc., Springfield, Mass., announces the following appointments: CHARLES R. CROWDER, president; ROGER S. PYNE, vice-president; T. W. BAUSH, vice-president; R. W. PORTER, treasurer-secretary; and SAMUEL McCullough, assistant treasurer. Negotiations have been completed for the acquisition of the Butterworth Co., a Pennsylvania corporation, through an exchange of stock. The Butterworth Co. is engaged in the design and production of washing, dyeing, bleaching, mercerizing, and embossing machinery for the textile and rayon industries.



Charles R. Crowder, president, Van Norman Machine Co.



J. Joseph Kelly, vice-president—sales, Reed-Prentice Corporation

REED-PRENTICE CORPORATION, Worcester, Mass., announces the following appointments: J. JOSEPH KELLY, vice-president in charge of sales, and FREDERICK W. McIntyre, JR., vice-president and works manager. An affiliate of Package Machinery Co., Reed-Prentice manufactures injection molding presses, die-casting machines, and machine tools.

NORTON Co., Worcester, Mass., has appointed the following men to managerial sales posts: ROBERT CUSHMAN, formerly West Coast district manager, has been named assistant to the sales manager, grinding wheels, and will return to the main office at Worcester, Mass.; HARRY G. BRUSTLIN, formerly abrasives engineer in the Los Angeles area, succeeds Mr. Cushman as West Coast district manager; DONALD F. JONES, formerly an abrasives engineer in the Syracuse, N. Y. area, has been appointed Pittsburgh district manager. He succeeds CHARLES B. PRICE, who retired after thirty-nine years with the company.

WILLIAM L. NEILSON, JR. has been appointed general sales manager of Greenfield Tap and Die Corporation, Greenfield, Mass. He joined the company in 1939 as export manager and has also been New England district manager since 1953. Before joining Greenfield he was for a number of years foreign sales engineer for Norton Co. of Worcester, Mass.



One operation 0.064 2450 Aluminu





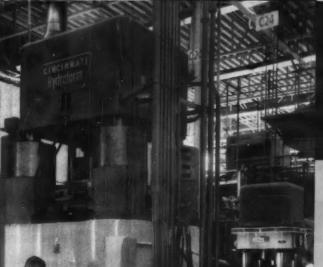
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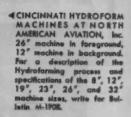
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One operation 0.025 RC70 Titan



One operation 0.051" 6150 Aluminum





Two operations 0.040" 6150 Alum



Two operations 0.032" 52SO Alumi



See other new products, Booth No. 100, ASTE Show

These are typical aircraft components produced on two Cincinnati Hydroform machines at North American Aviation, Inc. Hydroforming has increased their overall production of intricately-shaped parts . . . made from all types of materials ranging from aluminum to titanium . . . at very substantial savings in development and production time, in tooling, material and labor costs.

To determine if Hydroforming can produce similar savings for your manufacturing program, call a Cincinnati Milling field engineer.



See other new products, Booth No. 100, ASTE Show



CINCI Hydroform

PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO, U.S.A.

BLACK DIAMOND SAW & MACHINE WORKS, INC., Natick, Mass., announces its purchase of the manufacturing and sales rights to the Worcester Drill Grinder and the appointment of the Edward Blake Co., Inc., West Newton, Mass., as sole distributor.

WILLIAM F. CHRISTOPHER has been appointed manager, market development, for General Electric Company's Chemical Development Department, Pittsfield, Mass.

CHARLES H. HALLETT has been appointed manager of the Wallingford, Conn., plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Hallett began his career in the steel business with the Inland Steel Co., Chicago, Ill., the Ryerson parent company. He became a member of Ryerson Steel in 1941 at its Buffalo, N. Y., plant. He was transferred to the Chicago office in 1946, where he was engaged in sales work. In 1948, Mr.



Charles H. Hallett, manager, Joseph T. Ryerson & Son, Inc.

Hallett was moved to the plant in Los Angeles to head the sales division and returned to Chicago in 1954 as assistant sales manager.

PRATT & WHITNEY Co., INC., West Hartford, Conn., has purchased the assets and business of the Sterling Die Co., Cleveland, Ohio. The company will be operated as the STERLING DIE DIVISION of the Pratt & Whitney Co., Inc. No changes in operating personnel are planned.

RICHARD C. BANNON has been made vice-president in charge of sales of the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Mr. Bannon has been district manager of the Cleveland office since 1941. He was elected vice-president in 1954 and a company director in 1955.



John Hale

Paul H. Richardson, vice-president, Hartford Special Machinery Co.

PAUL H. RICHARDSON has been named vice-president in charge of engineering for the Hartford Special Machinery Co., Hartford, Conn. Prior to joining the company, he was general manager of the Paragon Gears Works, Inc., Taunton, Mass.

MERRILL A. HAYDEN has been appointed general manager of Waterbury Tool, Division of Vickers, Incorporated, Waterbury, Conn. He replaces WARREN E. ROUSE, who is retiring.

PRATT & WHITNEY Co., INC., West Hartford, Conn., announces the following appointments: IRWIN F. HOLLAND, special assistant to the manager of the Cutting Tool and Gage Divisions; and EDWARD J. SHAGES, factory manager of the divisions.

MARTIN C. BUTTERS has been appointed general manager of the



Martin C. Butters, general manager, Union Twist Drill Co.

Butterfield Divisions of the Union Twist Drill Co. at Derby Line, Vt., and Rock Island, Quebec, Canada. He will succeed STANLEY L. HOLLAND, who has been elected president of Union Twist Drill Co., Athol, Mass.

#### New York and New Jersey

AIR REDUCTION SALES Co., a Division of Air Reduction Co., Inc., announces a \$16,000,000 expansion program for 1956 to meet the rapidly increasing demand for its industrial gases. This expansion, plus the new facilities completed since 1951, brings the company's total investment increase in the gas-producing field over the six-year period to about \$50,000,000. Three new producing plants are scheduled for completion this year; at Chicago, Ill.; Alton, Ill.; and Calvert City, Ky. Additional producing facilities will also be installed at Butler, Pa., and output will be increased at Riverton, N. J. A portion of the appropriation will go toward expansion of gas-producing facilities in the Southwest. Included as well in this program are additional distribution facilities throughout the country.

E. B. SUYDAM has been appointed president of Linde Air Products Co., a Division of Union Carbide and Carbon Corporation, New York City. Mr. Suydam succeeds T. B. CARTLEDGE, who continues as the vice-president of the corporation. Mr. Suydam joined the company in 1916 as a salesman for the New York branch. In 1928 he was made manager of the southwestern region of the Linde Air Products Co. In 1929 he returned to New York, becoming gas sales manager vice-president in 1942.

ALCO PRODUCTS, INC., Schenectady, N. Y., announces the following appointments in its marketing division: PAUL N. STROBELL has been named marketing manager for atomic energy products; HERBERT M. SHORT has been appointed products manager of renewal parts; and FREDERICK TOWNSEND will be locomotive products manager. All three men will maintain their headquarters at Schenectady.

NIAGARA CUTTER Co., North Tonawanda, N. Y., announces the purchase of the Erie Tool Co., Buffalo, N. Y. The Erie Tool Co. and the Niagara Cutter Co. will operate as divisions of the newly established BOLLIER-DAMERELL, INC., maintaining its general offices at 367 Schenck St., North Tonawanda, N. Y.

DONALD G. STURGES has been appointed manager of the new products branch of the Research and Development Division of The Carborundum Company, Niagara Falls, N. Y.

WHAT	WHERE	WHY
SUNVIS 900	In tight systems where oil is rarely changed and little or no make-up is needed.	Exceptionally long life of oil keeps overall costs low.
SOLNUS	In tight systems where make-up oil is less than 5% per month.	Moderately priced excellent stability and rust protection.
SUNTAC	In leaky systems where make-up average is 5% or over per month.	Reduced leakage in systems cuts oil costs and downtime.
CIRCO	In systems where oil is continuously diluted by water, cutting fluids and other contaminants.	Low-pricedexcellent protection where oil must be changed frequently.
SUNVIS H.D.700	In systems contaminated by dust and deposits of sludge, varnish, etc.	Cleansing action removes deposits and eliminates costly teardowns.
LUBEWAY	In dual purpose systems of machine tools where hydraulic oil is also a way lubricant.	Added film strength of this hydraulic oil also eliminates "stick-slip" on ways.

# CHART SHOWS WHERE AND WHY SUN HYDRAULIC OILS SAVE MONEY

As the chart shows, to operate your hydraulic system at maximum efficiency and minimum cost you must consider the condition of your hydraulic system, as well as pressures, operating temperatures and other usual factors.

And, very important, you must consider the age of your system. Continued use of original oil recommendations can be costly. A change in the type of oil can often result in substantial savings...especially where systems have developed leaks or where sludge and varnish cause excessive maintenance.

For complete information about how Sun hydraulic oils can help you cut operating costs of your hydraulic system, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa. Dept. M-2.



INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

LESLIE E. SIMON, Major General, U. S. Army, (Ret.), formerly assistant chief of ordnance for Research and Development of the U. S. Army Corps, has been appointed director of the Research and Development Division of The Carborundum Company, Niagara Falls, N. Y.

EDMUND J. KLONOWSKI has been appointed western New York representative for the Punch Products Corporation, Niagara Falls, N. Y. manufacturer of hole-punching and notching equipment. His headquarters are at 351 Burroughs Drive, Snyder 21, N. Y.

WILLIAM M. HAILE has been appointed a vice-president of Linde Air Products Co., a Division of Union Carbide and Carbon Corporation, New York City. Mr. Haile joined the company in 1925 in Linde's Southern Division Office in Birmingham.

CLINTON L. Howe has been appointed district sales manager of the Gerrard Steel Strapping Division, U. S. Steel Corporation, New York City, with headquarters at Englewood, N. J. He succeeds EUGENE B. KOVATS, who has been named district sales manager at McKees Rocks, Pa.

LOREN C. HURD has been appointed president and a director of Metals Disintegrating Co., Inc., Elizabeth, N. J. The company is a subsidiary of American Marietta Co., Chicago, Ill.

PAUL E. KELLY has been appointed assistant manager of sales for the Alloy Tube Division, Carpenter Steel Co., Union, N. J. He will be located at the division's home office and mill in Union.

WATSON-STILLMAN FITTINGS DIVI-SION, H. K. Porter Co., Inc., Roselle, N. J., has changed its name to W-S Fittings Division.

HEALD MACHINE Co., Worcester, Mass., announces an address change for its New York territory. The new address will be 17 Elm St., Morristown, N. J.

GENERAL ELECTRIC Co., Schenectady, N. Y., announces the purchase of substantially all of the assets of the Watson Flagg Machine Co., Paterson, N. J.

#### Ohio

RELIANCE ELECTRIC & ENGINEER-ING Co., Cleveland, Ohio, announces the opening of a new sales office in Dayton, Ohio. This office, which will serve the general area of central Ohio, is located at 410 W. 1st St.



Ludlow King, assistant to executive vice-president of the National Machine Tool Builders' Association

LUDLOW KING has been appointed assistant to Tell Berna, executive vice-president of the National Machine Tool Builders' Association. Mr. King, a lieutenant colonel in the Army Chemical Corps during World War II, served as chief of the Inspection Division, executive officer of Materiel Command, and corps chemical officer. He was awarded the Legion of Merit, Bronze Star, and Purple Heart medals and was given a full colonel's commission. Mr. King joined the Owens-Corning Fiberglas Corporation as Washington branch manager and then became manager of services to the Federal Government. He was the first elected president of the Armed Forces Chemical Association, serving two terms. He also served for two years as chairman of the coordinating committee of the Armed Forces Association, arranging industry-Armed Forces conferences throughout the country; and for two terms as president of the American Ordnance Association, Washington post. In 1952, Mr. King became vice-president of the Plastics Division of the Universal Moulded Products Corporation of Philadelphia, with headquarters in Washington. Mr. King has had broad experience in the field of industrial sales and Government relations.

ELECTRO METALLURGICAL Co., a Division of Union Carbide and Carbon Corporation, New York City, announces construction of the first titanium sponge plant which will utilize the sodium reduction process in the United States at Ashtabula, Ohio. For the past year, construction crews have been transforming the 100-acre site into the new plant which will mark the company's entry into titanium sponge production.

A. STEWART MURRAY was elected president of the Tyson Bearing Corporation, Massillon, Ohio, a subsidiary of SKF Industries, Inc. Assistant to the president of SKF and a Tyson director since 1955, Mr. Murray replaces H. I. Lewis who resigned as president and director, but will be available as a consultant and adviser.

THOMAS G. BISHOP has been appointed sales manager of the Hydraulic Press Mfg. Co., Plastic Machinery Division. He returns to the company's Mount Gilead, Ohio, plant after serving as assistant manager in Teaneck, N. J., eastern office, where he was in charge of plastic machinery sales.



Donald M. Pattison, vice-president of Motch & Merryweather Co.

DONALD M. PATTISON has been elected vice-president of Motch & Merryweather Co., with headquarters in the Penton Building, Cleveland, Ohio. Having served as a director of marketing, Mr. Pattison continues to be responsible for those duties, as well as for directing the sales policies of the company.

MARTIN C. FALK has been appointed chief research engineer for the Yoder Co., Cleveland, Ohio.

## Pennsylvania and Georgia

J. George Breitling has been appointed industrial sales manager of the Scott Paper Co., Chester, Pa. He joined the company as an industrial salesman at Baltimore in 1945, moving to Philadelphia as district manager in 1947. He was appointed assistant to the industrial sales manager in 1949, and in 1952 he became director of sales training. He was

named sales personnel manager in 1954 and soon after that assistant industrial sales manager, the position he has held until the present time.

Vanadium-Alloys Steel Co., Latrobe, Pa., announces the following appointments: R. D. Bardes and Charles A. Lundy have been appointed district managers. Mr. Bardes replaces John N. Sturmer of the St. Louis district, and Mr. Lundy will head the Cincinnati office in place of Fred W. Potts. The newly appointed district managers are experienced steel tool salesmen, well qualified from their engineering backgrounds to deal with special quality steel needs of their territories.



Claude L. Boring, general manager of Erie Foundry Co.

CLAUDE L. BORING has been appointed general manager of Erie Foundry Co., Erie, Pa. Mr. Boring has been with the company for one year, serving in the capacity of assistant to the president. He was previously divisional vice-president of the Plumb Tool Co.

ALLEGHENY LUDLUM STEEL Co., Pittsburgh, Pa., announces the following appointments: RUSSELL M. ALLEN is retiring as vice-president in charge of sales but will continue as vice-president and director. He will be succeeded by WILLIAM B. PIERCE, who was formerly vice-president and technical director. Dr. Rush A. Lincoln has been appointed technical director to succeed Mr. Pierce. Roger S. Ahlbrandt, who served temporarily as executive assistant to the sales vice-president, will assume his duties as treasurer.

T. R. ALMOND MFG. Co., Willoughby, Ohio, has been acquired by Kennametal, Inc., Latrobe, Pa., and is being operated as a wholly-owned subsidiary. BALDWIN-LIMA-HAMILTON CORPORATION, Philadelphia, Pa., announces plans for construction of a new manufacturing plant at Waltham, Mass. The new plant is to be completed by September 1956 and will have 102,000 square feet of floor space for a newly organized electronics and instrument division of the company.

FORNEY'S INC., New Castle, Pa. has acquired all of the design, engineering and manufacturing data, together with all patterns, on the complete line of Barrett machine tools, both standard and special, made by Barrett Machine Tool Co., Meadville, Pa.

THE TEXAS Co., New York City, announces that it will expand its specialized service to Southern industry by opening a regional office of the Technical Service Division in Atlanta, Ga., at 873 Spring St., N. W. The office will be under the direction of J. F. COLLINS, JR.

## Wisconsin, Michigan, and Indiana

GEORGE GORTON MACHINE Co., Racine, Wis., announces the following appointments: GEORGE GORTON, Vice-president; CHARLES GORTON, Vice-president in charge of manufacturing; JAMES GORTON, Vice-president in charge of research and development; WALTER B. TOMLINSON, Vice-president and treasurer; HOWARD C. HOLMDOHL, secretary; and JOHN ELHOLM, JR., assistant secretary. In addition to the above, five directors comprise the new board which includes George Gorton III, Charles Gorton, James Gorton, Walter B. Tomlinson and Kenneth N. Findley.



George Gorton III, president, George Gorton Machine Co.

CLAYTON K. BAER has been appointed manager of Crucible Steel Company of America, Milwaukee, Wis., sales branch. Prior to his appointment he was assistant to the manager of the company's sales division. The Milwaukee sales branch handles products in northeastern Wisconsin—south to Racine and west to Madison and the Fox River Valley. The branch also handles the full line of welded stainless tube and pipe of the Trent Tube Co. of East Troy, Wis., a subsidiary.

WARNER ELECTRIC BRAKE & CLUTCH Co., Beloit, Wis., will complete a second manufacturing plant costing \$1,000,000 by mid-1956. The new factory will be built on a 64-acre site located in Illinois 3 miles south of Beloit. It will occupy 100,000 square feet.

DON M. MCPHERSON has been made general manager of Willey's Carbide Tool Co., Detroit, Mich. Mr. McPherson, with the company since 1953, was formerly with Ex-Cell-O and has a thorough knowledge of the requirements of the users and fabricators of carbide tools.

ILLINOIS TOOL WORKS, Chicago, Ill., announces that its Detroit sales office and its Shakeproof Division have moved to new quarters at 1403 E. State Fair. These offices occupy all of the new building. Enlarged facilities will permit increased service to customers for the Detroit area.

WILLIAM KILLION has been appointed sales engineer of Whitman & Barnes, Inc., Plymouth, Mich., for North and South Carolina and eastern Tennessee.

WILLIAM E. JUDD has been appointed general manager of the U. S. Machine Division of Stewart-Warner Corporation, Lebanon, Ind. He succeeds CARL J. WINKLER, SR., who retired.

#### Calculator Simplifies Milling Machine Set-up

A dual-purpose calculator for simplifying milling machine set-ups has been developed by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. One side of the calculator is used to quickly determine the spindle speeds and feed rates that are adequate for tool-room operations, joblot milling, or short production runs. On the other side, a modified cutting speed can be determined that will result in the minimum cost per piece for high-production milling jobs.

The calculator measures approximately 5 by 8 inches and is made of durable plastic. Copies may be obtained from the company at \$1.00 each.

## Obituaries



**Theodore Trecker** 

Theodore Trecker, founder and honorary chairman of the board of Kearney & Trecker Corporation, Milwaukee, Wis., died on December 21, 1955, at the age of eighty-seven years. Mr. Trecker founded the corporation with the late E. J. Kearney, a design engineer, in 1898. He was a pioneer in the development of milling and special machine tools and first president of the firm he helped to organize.

Howard T. Hallowell, chairman of the board and a founder of Standard Pressed Steel Co., Jenkintown, Pa., died December 25, 1955 at the age of seventy-eight years. An industrialist with a farm boy background, Mr. Hallowell was an inventor and pioneer in industrial research and development. In 1906 he was awarded the John Scott Medal by the City of Philadelphia for his development of a pressed-steel hanger, a contribution to industrial safety. Surviving Mr. Hallowell are his wife, a daughter, a son, and three grandchildren.

Frank Edward Payne, chairman of the board and co-founder of Crane Packing Co., Chicago, Ill., died on November 20, 1955. He was seventy-two years old. Starting his career as a pump salesman, Mr. Payne gained much of the first-hand knowledge that led to his part in the founding of Crane Packing Co. He became president in 1917 and was active in that capacity for the following 34 years. He is survived by his widow and daughter.

JAMES McElgin, manager of the metal-working department of E. F. Houghton & Co., Philadelphia, Pa., died on December 7, 1955 at the age of fifty-four years. He had been with the company since 1924.

#### Walter H. Dreis

Walter H. Dreis, president, treasurer, and general manager of Dreis & Krump Mfg. Co., Chicago, Ill., died on December 8, 1955 at the age of



Walter H. Dreis

sixty-seven years. Mr. Dreis was the son of Herman C. Dreis, one of the founders of Dreis & Krump in 1899. He is survived by his widow, three daughters, and a brother.

## Coming Events

MARCH 19-23—Industrial Exposition sponsored by the AMERICAN So-CIETY OF TOOL ENGINEERS to be held at the International Amphitheatre, Chicago, Ill. For further information write to Harry Conrad, executive secretary, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.

APRIL 10-12 — Twelfth annual meeting of the Metal Powder Association and 1956 METAL POWDER SHOW in Cleveland, Ohio, with head-quarters at the Hotel Cleveland. Additional information can be obtained from the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.

MAY 9-11—National Spring Technical Meeting and Welding and Allied Industry Fourth Exhibition of the AMERICAN WELDING SOCIETY will be held at Memorial Auditorium, Buffalo, N. Y. For further information write to the American Welding

Society, Inc., 33 W. 39th St., New York 18, N. Y.

MAY 14-17—First Design Engineering Show will be held at Convention Hall, Philadelphia, Pa. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 14-17—AMERICAN SOCIETY OF MECHANICAL ENGINEERS sponsors a conference to study industry's problems in design engineering. It will be held at Convention Hall, Philadelphia, concurrently with the First Design Engineering Show. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 17-19—New York State Society of Professional Engineers will hold its Thirtieth Engineering Industries Exposition in conjunction with its Annual Convention at the Statler Hotel in New York City. For further information, write to Harold Becher, chairman of publicity, New York State Society of Professional Engineers, 1941 Grand Central Terminal, New York 17, N. Y.

MAY 17-19—Engineering Industries Exposition, Statler Hotel, New York City. The Consolidated Edison Co. will exhibit a scale model of the reactor which it is constructing at Peekskill, N. Y., to supply atomic energy to New York State. George Baer, of the Foster-Wheeler Corporation, is chairman of the convention committee.

#### **Available Motion Pictures**

PROPERTIES OF DUCTILE CAST IRON

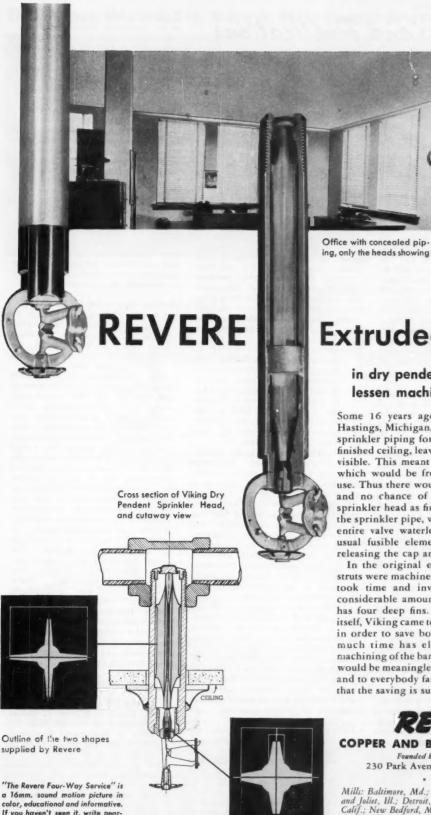
A motion picture on the properties and applications of ductile cast iron, the first such film to be released by the International Nickel Co., Inc., 67 Wall St., New York City, is now available for use by industry, technical societies, and educational institutions. The fifteen-minute sound-color film—"Ductile Cast Iron"—graphically illustrates the fact that this new material has properties similar to those of steel.

#### MACHINE REPLACEMENT

Obsolete machinery impedes progress and wastes money. "William Johnson and the Draggin'" is the title of a 16-millimeter sound film in Technicolor that stimulates interest in effective machine replacement.

William Johnson, engineer, acting on behest of King Customer, locates various "draggin's," including the serious "draggin' from obsolescence," with his "draggin' locator."

To borrow the thirteen-minute film, write to the advertising department of the Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



**Extruded Shapes** 

in dry pendent sprinkler heads lessen machining, save money

Some 16 years ago the Viking Corporation, Hastings, Michigan, decided to find a way to put sprinkler piping for dry pipe systems above the finished ceiling, leaving only the sprinkler heads visible. This meant designing a sprinkler head which would be free of water except when in use. Thus there would be no drainage problem, and no chance of freezing. The dry pendent sprinkler head as finally developed extends into the sprinkler pipe, where a bronze cap keeps the entire valve waterless. When a fire occurs the usual fusible element melts, two struts drop, releasing the cap and permitting water to flow.

In the original experimental work, the two struts were machined out of solid brass bar. This took time and involved the generation of a considerable amount of scrap, since each struhas four deep fins. Once the idea had proved itself, Viking came to Revere for extruded shapes, in order to save both machining and metal. So much time has elapsed since the original machining of the bar that comparative cost figures would be meaningless, but it is evident to Viking, and to everybody familiar with extruded shapes, that the saving is substantial.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801 230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside Calif.; New Bedford, Mass.; Newport, Ark.: Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere

For more information fill in page number on Inquiry Card, on page 245

est Revere Sales Office.

MACHINERY, February, 1956-259

## New Books and Publications

MECHANISM. By Joseph Stiles Beggs.
418 pages, 6 by 9 inches. Published by the McGraw-Hill Book
Co., Inc., 330 W. 42nd St., New
York 36, N. Y. Price, \$6.50.
This book was originally written

This book was originally written for the course in advanced kinematics developed by the author in the Department of Engineering at the University of California. It has now been brought out to provide the practicing design engineer with a reference book for the analysis of mechanisms and a source of mechanical movements.

Among the new subjects covered are the hydraulic controls of the Packard automatic transmission and the material on space mechanisms. An idea of the treatment and the various mechanisms covered will be obtained by the following list of chapter headings: Position, Velocity, and Acceleration; Gears; Cams; Rotary Drives; Linkages; Tension and Flexural Links; Compression Links-Fluids; Computing Mechanisms; Control of Mechanisms; Special Topics; Newtonian Mechanics of Rigid Bodies; and A Repertory of Mechanism.

BEARING LUBRICATION ANALYSIS. By R. R. Slaymaker. 108 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$5.

Written for the machine designer rather than the lubrication specialist, this work deals with the general principles of lubrication analysis in bearing design. The treatment is broad enough to provide the insight needed to design actual bearings for simple cases and to handle the preliminary planning for more complex applications in cases where a bearing specialist will later be consulted.

The treatment stresses the common sleeve type bearing. Case studies and numerical examples illustrate the discussion. There is a useful outline of hydro-dynamic theory as a guide to the design of bearings lubricated from an external source. Also, the characteristics of various bearing materials are discussed, and an analysis of oilless bearings is given. Throughout the book the vital topic of oil viscosity is emphasized. The author presents a practical method of predicting temperature rise and oil viscosity in one operation, eliminating trial-anderror solutions. This method is illustrated by actual case reports.

HANDBOOK OF BARREL FINISHING. By Ralph F. Enyedy. 255 pages, 7 by 10 inches. Published by the Reinhold Publishing Corporation, 430 Park Ave., New York 22, N. Y. Price, \$7.50. Barrel finishing, known also as tumbling, tumble grinding, and barrel rolling, has been used in industry for many years. In its early stages, this process was used only for rough operations, but during the last decade it has been applied to precise and delicate work. Complete details on the barrel finishing of metal and plastic parts are given in this volume.

Every phase of barrel finishing from cleaning and de-slugging to coloring, polishing, and burnishing is covered in step-by-step sequence. More than 150 complete specification sheets provide all the information necessary for finishing a large variety of parts. The latest developments in equipment, finishing compounds, and methods are described in detail. It is stated that much of the information on such operations as preparation of metals for sealing to glass, deburring of screw machine parts, and multi-barrel processing has not previously appeared in print.

DIECASTING DIE DESIGN. By H. K.
Barton and L. C. Barton. 151
pages, 5 1/2 by 8 1/2 inches, 232
illustrations. Published by the
Machinery Publishing Co., Ltd.,
National House, West St., Brighton 1, England. Sold in the
United States by THE INDUSTRIAL PRESS, 93 Worth St., New
York 13, N. Y. Price, \$3.

This latest addition to the British Machinery's Standard Reference Series is directed primarily to diecasters but is intended also as a guide for die designers. The aim throughout is to analyze and group together various recurrent features in die construction and to show their advantages, as well as disadvantages, under a wide variety of operating conditions. This approach should help considerably to reduce the number of trial-and-error methods used in die-casting design and their attendant expenses.

Purchasers and designers will accordingly find considerable information on how to avoid those features in die-casting design that increase cost, reduce dimensional accuracy, or detract from the attainment of sound structure and good finish.

All examples presented have been obtained from British, European, and American sources and are representative of current practice.

PRINCIPLES OF METAL CASTING. By Richard W. Heine and Philip C. Rosenthal. 639 page<sup>3</sup>, 6 by 9 inches. Published by the Mc-Graw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, \$7.50.

This book, which was prepared in cooperation with the Textbook

Committee of the Education Division of the American Foundrymen's Society, comprises a comprehensive treatment of the subject of metal casting, suitable for use either as a general foundry process survey course or as a more detailed technical course in basic foundry metallurgy.

The text covers molding processes, including sand casting methods, shell molding, die and permanent mold casting, and investment casting. It also discusses mold materials and construction, molding equipment, solidification of metals, gating and feeding of castings, molding sand technology, cleaning of castings, castings design, metallurgical principles associated with melting, composition and properties of casting alloys, heat-treatment, and metallurgical processing characteristics of foundry practices. Sample questions and calculations, tables, graphs, line diagrams, photographs, etc., are used to illustrate the principles.

METALS HANDBOOK (1955 Supplement). 208 pages, 8 by 11 inches; 214 tables, 256 charts, and 411 illustrations. Published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price \$6.

This supplement to the ASM Metals Handbook follows the general plan used in the 1954 supplement, giving practical information on a wide variety of metal-working subjects that require up-to-date reference material. There are twenty-one articles divided among four main sections: metals and applications, design and application, processing and fabrication, and testing and inspection. A general idea of the scope of the subject matter can be had from the titles of a few of the articles: "Selection of Aluminum Casting," "Selection of Gray Cast Iron," "Selection of Electrodes for Manual Arc Welding of Low-Carbon Steel," "Injection Hardening and Tempering," "Flame-Hardening," "Surface Fin-"Gas Carburizing," Cleaning Costs," and "Radiography of Metals." The supplement to the Metals Handbook consists of a highly organized collection of practical information that should meet the needs of designers, engineers, supervisors, and management in the metal-working industry.

AMERICAN STANDARD PREFERRED LIMITS AND FITS FOR CYLIN-DRICAL PARTS (ASA B4.1 1955) 21 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

The standard presents definitions of terms applying to fits between plain (non-threaded) cylindrical mating parts and makes recommen-

(Continued on page 264)

## Do You Want To Save Horsepower and Heat?

## VICKERS

Two-Pressure Oil Hydraulic Pumps
Require Less Power
for
Two-Pressure Circuits

## Automatically Provide

High Volume @ Low Pressure for fast closing, rapid advance, and rapid return.

Low Volume @ High Pressure for feeding, compressing, clamping, and holding.

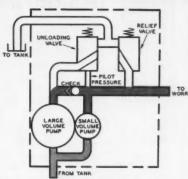


Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

For example, in closing a press or in rapid advance, both pump cartridges work together, supplying maximum volume for quick operation (see Fig. 1). When the press is closed and compression begins, or when the tool goes into feed immediately prior to beginning the cut, the large volume cartridge is automatically unloaded to the reservoir at zero pressure (see Fig. 2). The small volume cartridge alone then provides the lower volume required at high pressure.

These Vickers Two-Pressure Pumps are most economical in power consumption for such two-pressure operation. The reason for this is that a small-volume pump working at full capacity is MORE EFFICIENT than a large-volume pump working at partial capacity. Regardless of momentary delivery, the internal leakage of any pump is proportional to its size and operating pressure. The chart (Fig. 3) shows an interesting comparison between a Vickers Two-Pressure (Two-Volume) Pump and a variable volume vane type pump on a press circuit.

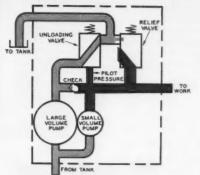


Fig. 2 Delivering Small Volume at High Pressure

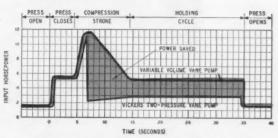


Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of recurring to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

VICKERS Incorporated

DIVISION OF SPERRY RAND CORPORATION

Application Engineering Offices: ATLANTA OCHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON LOS ANGELES AREA (El Segundo) MINNEAPOLIS NEW YORK AREA (Summi, N. J.) MILADELPHIA AREA (Media) PITTSBURGH AREA (M. Labanen) PORTLAND, ORE. ROCHESTER ROCKFORE SAN FRANCISCO AREA (Berkeley) SEATILE ST. LOUIS UNUSAN HARMON WASHINGTON WORESTER OF THE ST. LOUIS TULSA WASHINGTON WORESTER OF THE ST. LOUIS OTULSA WASHINGTON WORESTER OF THE ST.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

## Try These PLUS Features for Production-Plus!

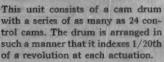


THE PROTECTED CONTROL CENTER, all-electric, is at the operator's fingertips. In addition to all conventional controls are a feed meter for all front and rear carriage feed settings; a work-drive motor horsepower meter.

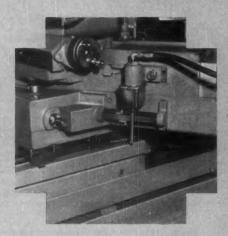
something new in Tailstocks. A single operating handle moves the air-operated antifriction mounted tailstock spindle forward to center in the work. When center is firmly positioned, an interlock releases handle so that it can be pushed farther into second position which closes the air-actuated chuck jaws and clamps the tailstock spindle.



#### 4 MULTI-CYCLE PROGRAMMER-



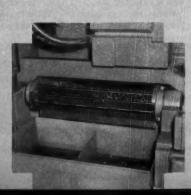
The cams control a series of switches which in turn causes changes of feeds, speeds, lengths of cut, pick up of rear slide and other phases of the operational cycle. Indexing of the cam drum is accomplished by means of signals from electrical contact switches on the apron which contact easily adjustable dogs mounted in six sections on a slotted plate behind a sliding panel on the front of the machine. Here's instant versatility—no limitation of cycles—no wiring changes.



The MULTI-CUT DEVICE provides for as many as four completely automatic passes of the tool over the work piece. The first two roughing passes are controlled by an air-actuated indexing stop unit working in conjunction with the "Air-Gage Tracer" stylus. The third semifinish pass and fourth finish pass are template controlled. One template is stacked on the other with automatic indexing taking place as required during the cycle.

The Multi-Cut Device makes short work of jobs requiring heavy stock removal.

GOODBYE, MR. CHIP! Independently powered chip conveyor for removing chips from pan is optional. Conveyor can be used, if desired, to feed chips into a centralized chip disposal system.



## See What We've added



# for the Latest in AUTOMATIC MULTI-CYCLE TURNING!

THE MONARCH MODEL 21 MONA-MATIC. Offered in 18", 30" and 42" length between centers. The single running tool turns, bores and faces practically any combination of diameters, tapers, forms, undercuts, shoulders, radii and chamfers in a single continuous cut. Tools on the rear carriage may be timed to perform necking, grooving and forming cuts automatically in the desired coordination with the front carriage cycle.

Already, at first glance, many production men tell us this is IT! You're doubtless familiar with the production records rung up by the established Mona-Matics, with the famed Air-Gage Tracer controlled single running tool. And with the Air-Gage Tracer's reputation as the most accurate duplicating device known.

Now, we've gilded the lily. We've added the exclusive Monarch Multi-Cycle Programmer, the Multi-Cut device, greater metal removing capacity—and a host of other new developments besides!

Weigh the value of these new features added to the production-line-proved Mona-Matic principle. All these, plus such optional features as constant surface cutting speed and full automation, make the Model 21 the fastest producing lathe on any production line.

Don't you want—right now! our illustrated booklet describing this new machine? Just clip the coupon to your letterhead . . . The Monarch Machine Tool Company, Sidney, Ohio.



Please Clip This Coupon to your Letterhead

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen

- ☐ I would like to know more about your Model 21 Mona-Matic Lathes. Please send me without obligation your illustrated Booklet #1806 with complete information and specifications.
- Please have a Monarch sales engineer call on me.

NAME

TITLE



dations on preferred sizes, allowances, tolerances, and fits for use wherever they are applicable. The standard is in accord with American-British-Canadian conferences for sizes up to a diameter of 20 inches.

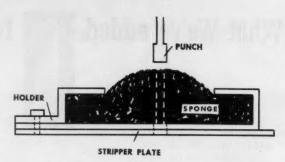
AMERICAN STANDARD SMALL SOLID RIVETS (ASA B18.1-1955). 14 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$1.

AMERICAN STANDARD SYSTEM FOR STRAIGHT BEVEL GEARS (ASA B6.13-1955). 9 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$1.

#### Soluble Oil in Sponge Lubricates Punches

An ingenious lubricating device, utilizing soluble oil soaked into a synthetic sponge, provides almost continual punch lubrication. The life of gang punches used on a 300-ton Cincinnati press brake has been lengthened from days to weeks. In soaking the sponge, Oakite soluble oil, used with a like amount of water, lubricates thirty punches which shear 1/2-inch holes in 3/16-inch thick steel plate.

Brushing of lubricant on the punches when they became dry proved to be a slow and unsatisfactory method. A substitute method



Each time a punch passes through the oil-soaked cellulose sponge, it receives a light film of lubricant.

was sought that would: (1) Keep the press bed clean; (2) Keep the work clean; (3) Lengthen the life of the punches; and (4) Effect a saving in the amount of lubricant used. An idea was conceived for installing a sponge in such a way that the punches would receive a light film of lubricant with each stroke. DuPont cellulose sponges were found to be suitable as they would not rot quickly due to oil saturation.

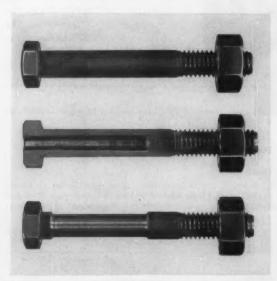
The device to retain the sponge consists of two holders of light-gage metal about 3 feet long, 1/2 inch high, and 2 inches wide, as shown in the accompanying illustration. Holes, slightly larger than the punch diameter and about the same size as the holes in the stripper plate, were drilled into the bottom of the holder. The stripper plate is located over the die, and is used to hold the work firmly against the press bed.

Synthetic sponge, 3 feet long, 1

inch high, and 2 inches wide, was compressed to fit into the holder. The holder was then bolted to the stripper plate. Compressing the sponge caused it to bulge from the 3/4-inch gap at the top of the holder.

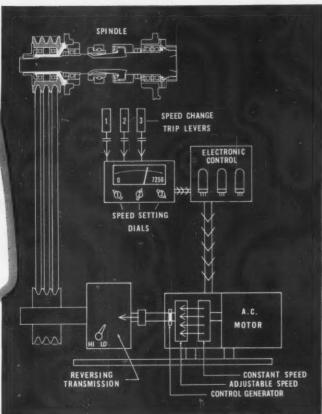
The sponge is soaked with the Oakite solution which coats the punches with a light film every time they pass through the sponge. Before using the device, punches had to be lubricated after every two strokes of the press, and were often replaced within two or three days because they were galled.

Now, the punches will run at least one hundred strokes before the sponge is resoaked. Since there is no perceptible heat generated, the same punches have been used for as long as two weeks of steady operation. Also, with the use of a soluble oil, the lubricant is easily removed from the punched work-piece in subsequent washing.



An unusual method of increasing the impact strength of bolts subject to shock loads involves the removal of a precise amount of metal from the bolt shank. At the top is shown a conventional machine bolt. Second from the top is a cut-away view of the same type bolt with a calculated amount of metal drilled from the center of the shank. A similar strengthening effect is obtained in the third bolt by removing an equal amount of metal from the outside of the shank.

How the simple electronic power system in the **Detroit Screwmatic** 750 guarantees top performance with minimum maintenance



THESE TYPICAL PARTS SHOW THE RANGE OF SPEED AND VERSATILITY

in this single spindle automatic



It works this way: To produce stepless spindle speeds and provide constant torque, a Louis-Allis Adjusto-Spede® power unit is used. It is made up of an integral combination of a standard A.C. squirrel cage motor and an Eddy current clutch.

The constant speed A.C. motor rotates the input member of the Eddy current clutch which is magnetically coupled to the output member and drives it at any pre-set speed. D.C. excitation for the clutch is produced by an electronic rectifier. The desired speed is selected by three speed setting dials in the operator's control station and is closely regulated by a tachometer generator in the clutch which feeds back a speed sensing signal to the controller.

Not only is maintenance easy, but you get these additional advantages:

- Precise, stepless speed setting. Three independent speeds available in each cycle.
- Holds speed closely under varying load conditions.
- Rapid, cushioned response when a change in speed is called for,
- Rugged, time-proved construction.
- Simple circuits and minimum of operating parts.



A Product of:

#### THE GEAR GRINDING MACHINE CO.

3921 Christopher Detroit 11, Michigan Manufacturers of: Fully Automatic Gear Grind Machines • Rzeppa (pronounced "Sheppa") Universal Joints

## MICROHONING\*...

# Efficient Stock Removal with LOW-VELOCITY ABRADING



NCREASINGLY, process engineers are recognizing Microhoning's lowvelocity abrading technique as a means of combining efficient stock removal with precision.

The Brooklyn Works of American Machine & Foundry Company, in the precision-manufacture of recoil mechanisms for artillery weapons, required a process that would most efficiently remove substantial amounts of stock and generate functional surface characteristics on the I.D. of recoil cylinders and O.D. of piston rods. After extensive study of available methods, AMF selected Microhoning as the most productive and economical process for obtaining desired results.

The floating piston in the recoil cylinder has nitrogen gas on one side and hydraulic oil on the other. Because silver ring seals are used, any error in geometry or roughness of cylinder or rod surfaces will induce deformation or scoring of silver rings and break these important seals.

The largest cylinder processed by AMF to date is for a 75 mm gun and has a bore diameter of 4.750 inches and a length of 46 inches. Piston rods for this gun are 1.375 inches in diameter and 56 inches long. Both I.D. and O.D. operations are on the same Microhoning machine—Model 450 Hydrohoner.

The Microhoning process efficiently removes up to .026 inch of stock from cylinders and .006 inch from rods to correct waviness, taper and out-of-roundness. A geometric tolerance of .0001 inch is held while obtaining a 1.5 microinch finish.

Working closely with AMF manufacturing personnel, Micromatic developed fixtures and tooling that minimize changeover time. The fixture for the cylinder is mounted on an indexing table so it is simply indexed away from the spindle while the rod is being Microhoned. You, too, can solve your precision stock-removal problems through application of Microhoning—the low-velocity abrading process.



For further information write for CROSS-HATCH, Vol. 7 No. 5
\*MICROHONING=

Stock Removal + Geometry + Size Control + Surface Finish

## MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE . DETROIT 38, MICHIGAN

## DOALL ELIMINATES "CUT AND TRY" GRINDING

### **Can Your Grinder Meet The Test?**



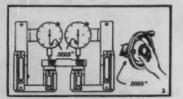
#### NO SPARK-OUT

Take a .020" cut with .020" crossfeed in 59-60 RC tool steel. A DoALL Grinder will run back through the cut with absolutely no sparkout!



#### ERASE PENCIL MARK

2. Now, put a pencil mark across the cut. Feed down .0001" and run the wheel through the cut again. A DoALL Grinder will erase the pencil mark!



#### DUPLICATE DIMENSION

3. Downfeed .0005" and grind ½ the width of the workpiece. Do the same to the opposite ½ of the surface. Both cuts will check out at .0005" when done on a DoALL!

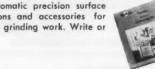
## WHAT FEED SETTING SAYS— DOALL GRINDER DOES!

If the downfeed calibrations of your grinder do not represent an equivalent amount of stock removal, then you are paying a premium for the work it performs. It is a costly waste of time to grind, and measure, then grind and measure repeatedly, to reach a desired dimension. Try the above test on your grinder. Then ask to see the same test on a DoALL Grinder. You'll see why grinding time on a DoALL is productive time!

Free literature—Ask for the DoALL Grinder Catalog describing a complete line of hydraulically operated manual or automatic precision surface grinders with modifications and accessories for flat, cylindrical and form grinding work. Write or call DoALL today.



Free demonstrations—Here you see men who had never before operated a grinder, remove stock exactly to downfeed settings by following simple instructions. Call your nearest local DoALL Store or write The DoALL Company, Des Plaines, Ill., for a free demonstration. Let DoALL grinder performance speak for itself.



Friendly DoALL Stores in 38 cities. Personalized service, complete stocks, local delivery.





NEW FILMS: Color . . . Sound . . . Analysis
"Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding."

GR-15



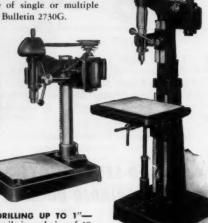
# Buffalo

## BUILDS THE TO MEET YOUR MOST

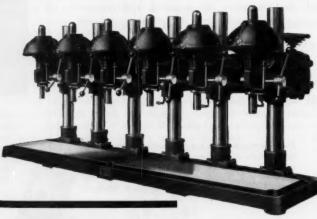
7/8" CAPACITY DRILLING—SENSITIVE OR POWER FEED—There's no better value in a 7/8" drill than the "Buffalo" No. 16! In 8", 12" or 15" overhangs with speed range from 400 to 3000 r.p.m. Round column, floor type, bench and pedestal models, 1 to 6 spindles. Top grade machines for easy operation and long life. Write for Bulletin 2730G.

HIGH-SPEED PRECISION PARTS DRILLING—"Buffalo" No. 14 Drills are high-speed, precision machines with capacity from the smallest commercial drill sizes up to \(^3\)\(\_8''\). Spindles are alloy steel with adjustable alloy steel sleeves for lasting accuracy. Full range of single or multiple bench or floor models. Write for Bulletin 2730G.

RUGGED 1/2" JOB AND PRODUCTION DRILLS—"Buffalo" No. 15 Drills are built for heavy production work, with full strength and rigidity. Extremely wide choice of models—tapping and slow speed attachments, tilt tables, radial drills, bench and floor single and multiple spindle models. Write for Bulletin 2963G.



"Buffalo" No. 18 Drills are built in a choice of 19 models to meet the most particular requirements . . . choice of feeds and table arrangements . . . 1 to six spindle models, bench and floor types. Precision ground spindles of chrome-nickel alloy with adjustable sleeve bearings for lasting accuracy. Bulletin 3123.





## BUFFALO

Canadian Blower & Forge



DRILLING

PUNCHING

268-MACHINERY, February, 1956

## HIGH-OUTPUT DRILL

## PARTICULAR REQUIREMENTS

THE DRILL WITH "EVERYTHING" FOR HIGH OUTPUT—The new "Buffalo" RPMster with adjustable-speed gearless drive is literally the smoothest, most convenient drilling machine you ever operated! Spindle speeds from 100 to 3,000 r.p.m. are adjusted in seconds. All-geared power feed reduces operator fatigue and margin of error. All parts are accurately machined and precision fitted. Ways are hand scraped for easier table adjustment. Here is the ideally accurate time-saver for the high-production shop—you have to see and operate this machine to believe it. Ask your "Buffalo" Machine Tool Dealer for details and demonstration!

LARGE CAPACITY—HIGH PRODUCTION—Here's the famous "Buffalo" No. 22 Drill with capacity up to 1½" drills—standing 96" high and built with all the strength and rigidity this heavy work requires—yet which is as easy to set up and operate as small, sensitive drills! All controls are within easy reach. All table and head-raising screws are easy to operate—all ways are hand scraped. Choice of 1 to 4 spindles, round column or pedestal. Write for Bulletin 2989G.



## FORGE COMPANY

BUFFALO, NEW YORK

Co., Ltd., Kitchener, Ont.













BENDING

For more information fill in page number on Inquiry Card, on page 245



MACHINERY, February, 1956-269

Electrical Discharge Machining produced this multiple cavity In

conventional machining time

hours

This Elox equipped · GRINDS . DIE SINKS ROUTS MACHINES MULTIPLE CAVITIES unparalleled efficiency and savings

Multiple Cavity in coolant retainer tank of Vertical Mill. Machined automatically without operator attention or broach cost.

Finished die and brass electrode. Die Material: HI Chrome Die Steel, Tolerances: +.0005"-.000 Finish: 15-20 micro inch.

> Our engineering staff is always ready to help solve your specific machining problems. Representatives in your area will arrange appointments, at your request, for grinding, die sinking and cavity forming operations at EDM Demonstration

Corporation of michigan **DEMONSTRATION CENTERS:** 

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Royal Oak 3, Michigan

Plant-Royal Oak, Mich. 45 Broad Ave., Palisades Park, N.J. 1907 W. Monterey, Chicago, Ill.

# cushman chucks give Chuck-ability

CHUCK-ABILITY: The ability to SPEED your work
... ELIMINATE fatigue ... IMPROVE your products
... and REDUCE your costs ... through design
and selection of the right work-holding devices.

## .. the Vew Accra-Set Chucks

- Ideal for precision bar work.
- Quick, simple, minute adjustment.
- Repeats within .0005" or better T.I.R.
- Rigid body with positive locking eliminates rotational slippage.
- Because of extreme accuracy and jaw capacity, one Accra-Set\* Chuck can replace even the most accurate collet chuck and its range of collets.

\* Patent applied for.



Available with 3 or 6 jaws in  $6^{\prime\prime}$ ,  $8^{\prime\prime}$  and  $10^{\prime\prime}$  sizes. Adapter plates required for mounting.

#### THE CUSHMAN CHUCK COMPANY

Hartford 2, Connecticut
a world standard for precision

Visit our Booth No. 579 ASTE Industrial Exposition.

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials.



SEE YOUR INDUSTRIAL DISTRIBUTOR

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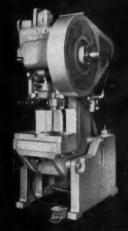
Air Operated Chucks, Cylinders, and Accessory Equipment... The Cushman Power Wrench... Cushman Manually Operated Chucks and Face Plate Jaws.



NEW DEPARTURE . DIVISION OF GENERAL MOTORS . BRISTOL, CONN.

## MINSTER PRESSES

mean less die repair, less scrap, less down time



Open Back Inclinable Presses 12 tons through 200 tons



Straight Side Two Point Presses 50 tons through 500 tons



Fixed Base Single Point Presses 32 tons through 200 tons



Straight Side Single Point Presses 50 tons through 600 tons



Piece-Maker Automatic Presses 20 tons through 200 tons



Knuckle Joint Embossing Presses 150 tons through 1500 tons

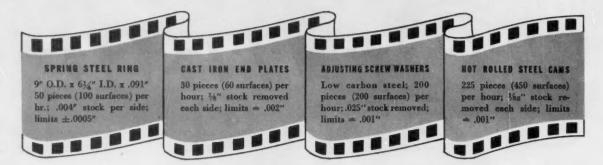
Minster Press Lines not shown above;

Two Point Gap Presses inclinable or fixed Base, 22 tons through 75 tons'
Horning Presses, 12 tons through 95 tons.

THE MINSTER MACHINE COMPANY

Minster, Ohio

MINSTER®



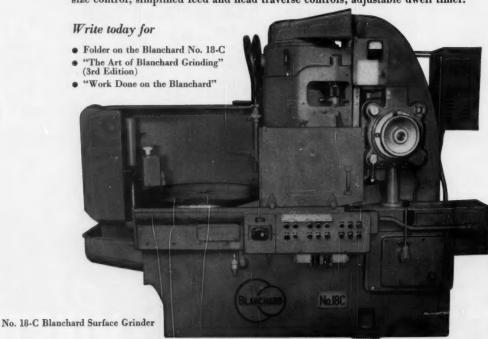
## NOW! BLANCHARD PRESENTS ANOTHER GREAT NEW GRINDER with Automatic Cycle Control

This great new Blanchard Surface Grinder performs a variety of jobs with speed, ease and accuracy,

One operator can easily operate two of these No. 18-C grinders under balanced conditions. By using the automatic cycle, he can unload, clean and reload one grinder while the other is grinding.

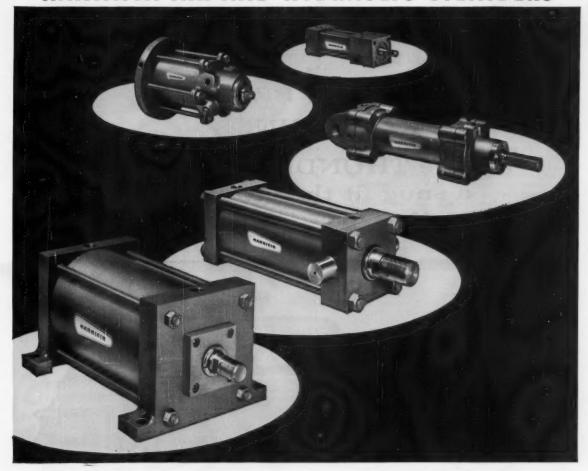
Here's what the automatic cycle does: moves chuck (30" or 36" dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size – "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position – demagnetizes chuck.

This new Blanchard also features: push button selection of manual or cycle operation; size control; simplified feed and head traverse controls; adjustable dwell timer.



THE BLANCHARD MACHINE COMPANY 64 STATE STREET, CAMBRIDGE 36, MASS., U. S. A.

## HANNIFIN AIR AND HYDRAULIC CYLINDERS



## To the engineer who wants the best cylinder—in a hurry

In the selection and purchase of cylinders look for:

**Completeness of Line.** Hannifin makes *five* lines of air and hydraulic cylinders in a range of bore sizes and mounting styles to meet every requirement and preference.

Leadership in Design. Hannifin cylinders are built to exacting quality standards and extremely close tolerances to insure easy, accurate mounting. Hannifin has also introduced the externally removable and replaceable bronze

gland cartridge, the most noteworthy improvement in cylinder design in the last 50 years.

Rapid Delivery. Hannifin can ship the cylinder you need in strokes up to 60" in any normal quantity within 48 bours.

Field Engineers, located in all principal cities, are as near as your telephone. Or, if your requirements are really urgent, call us at Des Plaines. Experienced sales engineers will handle your order.

## HANNI-FIN

MAIL THIS COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- For the present, just send complete catalog information on Hannifin cylinders including prices



Hannifin Corporation, 509 S. Wolf Rd., Des Plaines, III.

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-275

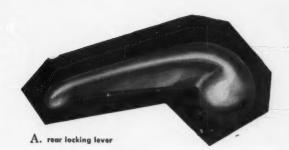
## MUELLER BRASS CO. FORGINGS

give THUNDERBIRD tops a snug fit the year around



The Motor States Products Division of Detroit Harvester Co.—a major supplier of top assemblies for convertibles —has found Mueller Brass Co. forgings an ideal answer for securely fastening down the tops on the Ford Thunderbird. In a summer shower or in the snow of winter the top is always snug and draft-free. There are a pair of each of the three Mueller Brass Co. forgings shown here used in locking the Thunderbird top securely around the sides and rear deck. The locking lever (A) is incorporated in the top and operates a locking pin that fastens into the rear hold down clamp (B). A pair of side hold down clamps (C) are located just behind each

door opening and clamp fasteners on the top hook into these forgings to rigidly hold the top in position. These forgings hold the necessary close tolerances and provide an excellent surface for buffing and chrome plating. In addition, the price is favorable and deliveries are good. For these reasons, as well as their inherent strength and durability, a switch to Mueller Brass Co. forgings can prove advantageous. Write today for our engineering manual (No. H-58565) . . . or better yet, call in one of our engineers to investigate possible forging applications in your products.







#### WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED



Mueller Brass Co. Forgings Engineering Manual H-58565

Tuf Stuf Aluminum Bronze Alloys

Engineering Manual H-58563

600 Series Bearing Alloys

Engineering Manual FM-3000 L
Copper Base Alloys in Rod Form
Engineering Manual FM-3010

METALS AND ALLOYS REVIEW



by FRANK M. LEVY, Director of Research

The other day one of our sales engineers stopped in to discuss gear applications and the subject got around to the amount of zinc permissable in gear and bearing alloys. Engineering books state that zinc is not desirable in bearing alloys. While this statement is true as regarding the commonly used copper-tin and copper-tin-lead alloys, it does not necessarily apply to other types of alloys. The 600 series bearing alloys, in which I am keenly interested, depend upon a high zinc content along with several other metal constituents to provide them with their fine hearing properties.

them with their fine bearing properties.

My explanation to our sales engineer was somewhat as follows: The question as to whether or not zinc is detrimental in a bearing alloy depends upon the remaining constituents in the alloy. A comparatively small amount of zinc is detrimental in a phosphor bronze alloy containing 80% copper, 10% tin and 10% lead. A zinc content of 4% is permissible in a bearing alloy containing 88% copper, 4% tin and 4% lead when used in an application not subject to heavy loads. In these alloys the tin combines with some of the copper to form a hard copper-tin constituent which is distributed through the soft copper matrix, or mat of copper. The higher the percentage of tin present, the greater the quantity of hard copper-tin constituent formed. Zinc also combines with copper increasing the hardness of the matrix. Therefore, when zinc is present along with a high tin content, the matrix becomes too hard and is "out of balance" resulting in poorer bearing qualities. In the 600 series, copper, silicon, manganese, etc., are present with zinc. There is sufficient manganese present to combine with the silicon to form a purple manganese silicide which is embedded in the copper-zinc matrix.

In the 600 series, copper, silicon, manganese, etc., are present with zinc. There is sufficient manganese present to combine with the silicon to form a purple manganese silicide which is embedded in the copper-zinc matrix. Since the manganese-silicide constituent has a much higher micro hardness than the copper-tin constituent in phosphor bronze, the matrix of the 600 series alloys can have a higher hardness without impairing the bearing properties. In this instance, zinc is not detrimental but desirable because it produces an alloy with a high Brinell hardness which resists pounding and distortion.

Like many engineers, we, too, were skeptical of the bearing properties of the first 600 alloy developed. A manufacturer of worm driven truck transmissions was having difficulty with the failure of chill east high tin bronze gears in busses used in the hilly section of Los Angeles and Pittsburgh, and solved his problem by using gears made from 600 metal.

Since that time, we have had over a hundred successful applications on difficult bearing problems where cast bearing bronzes have failed. An interesting observation is that once a customer uses 600 alloys, he not only finds other applications, but continues to use it over a long period of years. Our original customers are still on our books.

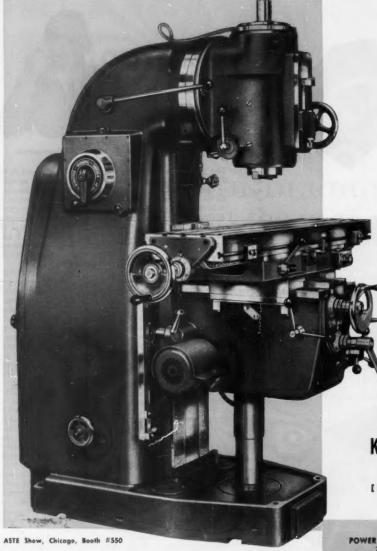
In conclusion, we agree that zinc is detrimental to the bearing properties of the phosphor bronze type of alloys, but is of benefit to the 600 series alloys, as it makes a harder matrix, permitting the alloy to resist pounding action better than the softer phosphor bronze alloys.

harder matrix, permitting the alloy to resist pounding action better than the softer phosphor bronze alloys. I've just about run out of space for this time but we'll have another subject for discussion later. If you have any problems or questions about non-ferrous alloys, just write me here at Mueller Brass Co. and we'll see what we can do.

## MUELLER BRASS CO.

PORT HURON 35, MICHIGAN

170





KONSTRUERAD FÖR

[ENGINEERED FOR SPECIALISTS]

SAJO'S NEW No. 2 VERTICAL MILLER MODEL VF-54

Built to U.S. Standards by Swedish craftsmen, this precision Miller meets exacting requirements at a modest price.

SAJO Model VF-54 is an ALL GEARED Vertical Miller with handscraped sliding surfaces, SKF "SP" anti-friction bearings on spindle and gear shafts, hardened chrome nickel gears, ground integral splines on gear shafts, externally adjustable back-lash eliminator for table feed screws, dial-selected feeds and speeds.

 $7\frac{1}{2}$  HP motor for spindle (5 HP optional).  $1\frac{1}{2}$  HP motor for table feed and 3 direction rapid traverse.

16 spindle speeds 39-1500 RPM (31-1200 optional), No. 50NMT spindle, 12 table feeds <sup>1</sup>/<sub>4</sub> to 25 inches/min. longitudinal and cross, <sup>1</sup>/<sub>23</sub> to 12½ inches/min. vertical. Power rapid traverse, all directions. Table travel 33½" long., 10" cross, 18" vertical.

Single adjustable START-STOP-BRAKE lever. Dial selection of speeds and feeds (U.S. inch calibrated) with single lever controls. Magnetic motor starter.

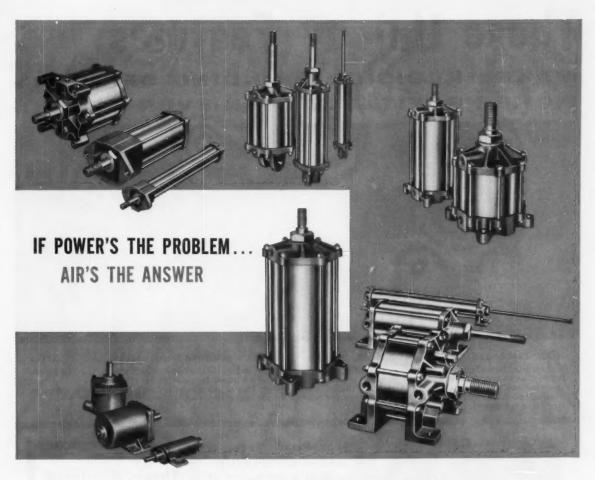
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USTIN INDUSTRIAL CORPORATION

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DEALERS IN PRINCIPAL CITIES . LOOK FOR THE AUSTIN SEAL . . . YOUR FULL GUARANTEE OF SATISFACTION

278-MACHINERY, February, 1956



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There is a Schrader Air Cylinder with power enough to meet any application. Ideally suited to pushing . . . pulling . . . lifting . . . lowering . . . wherever repetitive operations are required —Schrader Cylinders are used in innumerable applications in industries of all types.

Schrader has a complete line of cylinders that will meet any requirement. They are available in single or double acting, in bores up to 8" diameter, in any stroke, and in any type of mounting.

Schrader Air Cylinders will deliver controlled low-cost power to eliminate manual effort and for incorporation in automation designs. They make hard work easy and speed up production.

Don't forget, the complete Schrader line includes operating and control valves of every type, as well as all other compressed air accessories for air systems.

Write for Schrader Cylinder Specification Data or for information on the complete line of compressed air accessories.



**LEADERS IN AIR CONTROL SINCE 1844** 

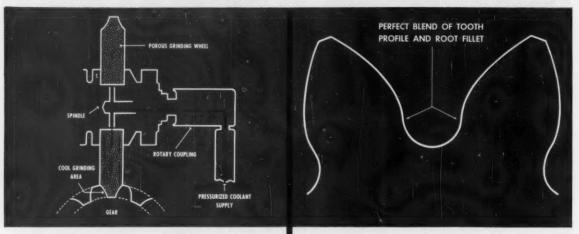


The complete Schrader line of pneumatic accessories includes everything you need

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454 Vanderbilt Avenue, Br	ooklyn 38, N. Y., Dept. F-2
I am interested in more	information on
. am imorosioa in moro	
Name	

# These Unique Features

## MAKE PRECISION GRINDING OF GEARS MORE PROFITABLE THAN EVER BEFORE



#### NON-TEMPERED, CASE-HARDENED GEARS

A controlled flow of coolant through the grinding wheel is supplied to the area between the grinding wheel and the gear tooth. This feature, coupled with the automatic down feed, virtually eliminates surface tempering and grinding checks.

#### PERFECT BLENDING OF FILLET AND PROFILE

Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet. This eliminates stress risers at the critical section of the tooth.



Pratt & Whitney's J-57 Turbojet: The most powerful aircraft production engine in the world is rated in the 10,000-pound thrust class.

## 19 Gear Grind Machines are used in the production of the Pratt & Whitney J-57

At Pratt & Whitney Aircraft, where finest quality gears and high production are essential to the manufacture of the J-57 Turbojet, 19 new automatic Gear Grind Machines are in daily use. Here is what Pratt & Whitney has to say:

"The new Gear Grind Machines presently used in the aircraft engine division are the first major development in this type of machine since their use at Pratt & Whitney. They were developed in cooperation with Pratt & Whitney engineers to meet the specific and exacting requirements of modern aircraft engine gears. These machines are equipped with a new wheel-trimming feature and a two-speed spindle drive to eliminate burning.

"Another advantage is the relative ease with which the involute profile can be modified."

56-C

Write today for Gear Grind's new comprehensive brochure.

#### These Advanced Features Are Also Available:

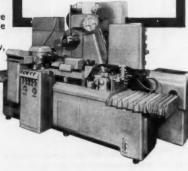
- Simplified modification of the involute gear tooth profile.
- Automatic trimming of the grinding wheel assures uniformly accurate work.
- Available as fully automatic machines incorporating automatic loading and unloading.



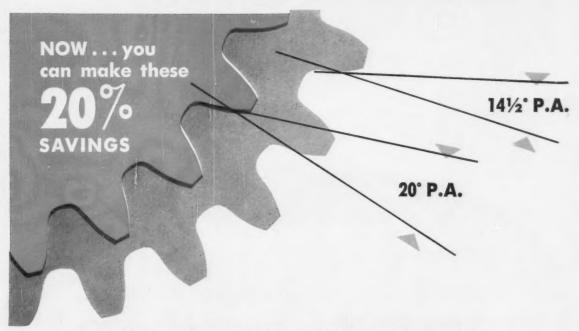
3921 CHRISTOPHER, DETROIT 11, MICHIGAN

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machine. RZEPPA ("Sheppa") Constant Velocity Universal Joints.



280-MACHINERY, February, 1956



## with 20° PRESSURE ANGLE GEARS

# **BOSTON GEAR now offers 441 Standard Stock Sizes**

Every engineer knows the mechanical advantages of the 20° P.A. tooth form. It's the standard for automotive drives, and wherever highest efficiency, with economy of space, weight, and cost are essential.

Now, BOSTON GEAR has the answer to the question of availability. A full range of standard stock sizes, supplied by all BOSTON GEAR Distributors, makes it practical to specify the 20° P.A. for virtually all spur, bevel, and miter gear applications.

Start making this big saving you've been missing. For details, call your BOSTON GEAR Distributor, or write: Boston Gear Works, 65 Hayward St., Quincy 71, Mass.

BOSTON GEAR CATALOG lists Standard Stock Sizes of 20° P.A. Spur, Bevel, and Miter Gears, along with the conventional 14½° P.A. Gears for every requirement. Ask for your copy.

		IN SP	ACE, NACE, N	WEIGI	
	****	141/29	P.A.	20°	P.A.
		Pinion	Gear	Pinion	Gear
	Pitch Diam.	2"	8.4"	1.66"	7.00"
· ·	Center Distance	5.200		4.333	
	Weight	1 lb.	7½ lbs.	¾ lbs.	5 lbs.
	List	1.05	0.45	1.70	4.70



7124 "OFF-THE-SHELF" TRANSMISSION PRODUCTS FROM YOUR LOCAL DISTRIBUTOR - AT FACTORY PRICES



For nearest Distributor, look under "GEARS", in the Yellow Section of your Telephone Directory

568G-G-18



TOWNSEND high speed shaver for grooving, shaving, facing, forming, chamfering and trimming.

TAYLOR and FENN 4-spindle drilling machine.



# Announcing

the merger of The Cleveland Tapping Machine Co.,

Cochrane-Bly and the Machine Division of Taylor & Fenn with

## TOWNSEND OF HARTFORD



COCHRANE - BLY multiple cutting automatic metal sawing machine.

## Leaders

in meeting industry's need

for Better Production at Lower Cost!



CLEVELAND TAPPING special index type machine for drilling, spotfacing, milling and tapping.

- . AUTOMATIC SCREW MACHINES
- RIVETERS SPRING PRESSES
- . DRILLING MACHINES
- . DUPLEX SPLINE MACHINES
- AUTOMATIC METAL SAWING MACHINES
- LEAD SCREW TAPPING MACHINES
- AUTOMATIC DRILLING and TAPPING MACHINES

Townsend of Hartford has been a pioneer in automation for many years, in the designing and building of automatic machines to fit the specific production needs of companies in many fields of manufacture.

Townsend has successfully coordinated the design and production of four important names in automatic machinery by merging The Cleveland Tapping Machine Co., Cochrane-Bly and the Machine Division of Taylor & Fenn, under the Townsend banner.

There is now a Townsend automatic for machining applications in every industry. Townsend's engineering . . . development . . . manufacturing facilities have an established record of efficiency and customer satisfaction.

Look to Townsend for leadership in automatic machines!



The H. P. TOWNSEND MANUFACTURING CO.

**ELMWOOD, CONNECTICUT** 

## WHY YOU GET

Precision Flatness, Finish and Parallelity in Production Quantities.

WITH A LAPMASTER

Here is the machine to do the job if you want precision flatness in production quantities at an economical rate. Lapmaster machines readily lap to the extreme close tolerance of one light band (0000116") or less. In addition, they produce an extremely fine finish to as low as 1 RMS.

Check these features and investigate the possibilities for the Lapmaster in your plant.

- Operator requires no previous lapping experience.
- Automatic timer provides controlled lapping cycle for production efficiency and allows time for pre-loading workholders.
- Simplicity of design allows ease of loading and unloading.
- Loose abrasive distributed evenly over lapping area insures uniform results.
- Serrated lap plate collects and disposes of spent compound and removed stock.
- Precision laps identical parts or parts of various shapes, heights and materials in one cycle.
- Self-conditioning lap plate eliminates down time for truing or replacement.

\*Protected by U.S. and Foreign Patents

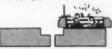


How the Lapmaster Works

The work being lapped causes wear on heavy cast iron lap plate.



As the work is wearing the lap, the conditioning rings are continually conditioning the lapping plate surface.



Since the wear action of the conditioning rings is greater than the wear caused by the work being lapped, the flatness of the lap relate is extensitedly maintained.

FREE



Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

Crane Packing Company, Dept. M-2, 6433 Oakton Street, Melrose Park, Illinois

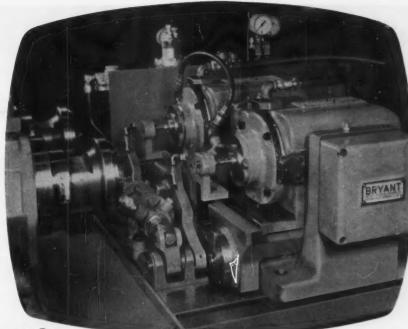


CRANE PACKING COMPANY





## Burring bearing bores...





# for greater accuracy and increased production

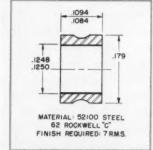
A manufacturer of extremely small ball bearings recently found that tooling the Bryant 998 precision boring machine with Bryant's new series 800 hi-frequency wheelheads resulted in higher production and fewer rejects.

The bores of hardened inner races are finished using burs to a tolerance of .0002, removing .005 stock – production, 280 pieces per hour at 100%.

The Bryant 998 is mechanically operated by positive cam action that provides constant tool control. Its table moves on pre-loaded, anti-friction ball slide ways. The ways are large-diameter hardened and ground steel bars that hold the table to a true path regardless of load or loading direction.

New series 800 Bryant hi-frequency wheelheads supply smooth, trouble-free operation for the toughest burring and grinding jobs at speeds from 10,000 to 100,000 R.P.M.

Write today for complete information on the Bryant 998. Ask also for information on Bryant Series 800 hi-frequency wheelheads.



# BRYANT

## chucking grinder co.

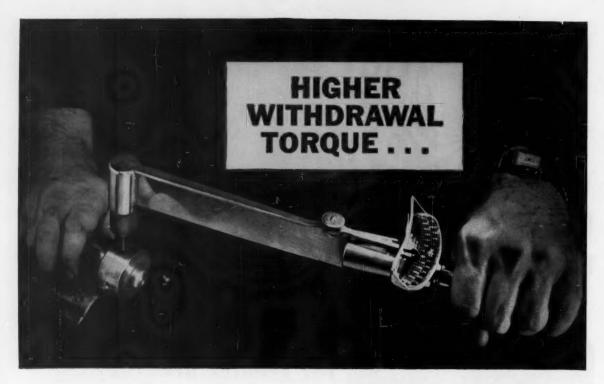
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Offices: Indianapolis · Cleveland · Chicago · Detroit · Mt. Vernon, N. Y. · Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic drum memory devices for computing systems

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-285



# **Greater resistance to removal holds Allenpoints tighter in your products**

Tests prove that ALLENPOINT Set Screws have 50% HIGHER WITHDRAWAL TORQUE than serrated point set screws



HIGHER WITHDRAWAL TORQUE WITH ALLENPOINTSI In 14" x 14" sizes, tightened to shear point of key, Allenpoints required 75 inch-pounds removal torque. Serrated point set screws gave up their hold at only 50 inch-pounds removal torque.



ONE MORE FULL THREAD WITH ALLENPOINTS! Compare, and you'll find that Allenpoints have one more full thread than same size serrated point set screws. That means greater holding power, especially in the much-used "square" sizes.

DEEPER, CLEANER SOCKETS WITH ALLENPOINTS!
Allenpoint sockets are "pressur-formd" to preserve the long fibers of the steel uncut throughout the entire length of the screw. This makes a deep socket of maximum strength, in which the key seats with great exactness.

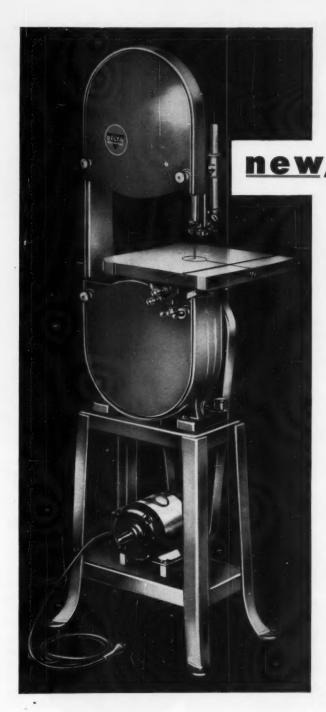
Specify ALLENPOINTS for far greater holding power—the kind of fastenings that "stay put". Genuine Allenpoints and other Allen fasteners are available from your Industrial Distributor—standard items immediately, special items very promptly. Write for full information.

You want maximum holding power from every set screw in your product. Here's why you'll get that from ALLENPOINT © Set Screws: Allenpoints and serrated point set screws were recently compared in laboratory tests. They were the kind of tests you'd make in your own plant — random samples of each were chosen from regular stock boxes from distributors' shelves.

In each test, keys were tightened right up to the shear point — maximum tightening point for any set screw. In each test, 50% HIGHER WITHDRAWAL TORQUE was required to release the ALLENPOINT O Set Screws.

Translated into your own product, this means more dependable fastening with ALLENPOINTS.







Another Product by Rockwell



DELTA QUALITY COSTS NO MORE

For more information fill in page number on Inquiry Card, on page 245

## new, improved

**ROCKWELL-BUILT** 

# DELTA

# 14" metal-wood cutting band saw

All the smooth-running proved performance of the previous model—plus these new cost-cutting features make the new Delta 14" Band Saw more useful than ever:

- New accessible clutch gives you faster, easier speed changes that add up to big savings in valuable production time.
- Seven new metal cutting speeds ranging from a new low 40 fpm.—the lowest speed in industry with a *standard* motor—give you fast easy cuts in hard steels and forgings as well as all other kinds of metal.
- The only 14" metal-wood band saw that gives you all these quality features—at an extremely low price!

See the new DELTA 14" Band Saw—try it—compare it! Get all the facts, then make up your own mind! Your Delta Dealer is listed under "TOOLS" in the classified pages of your phone book. Send the coupon for complete details.

#### SEND THE COUPON TODAY!

Delta Power Tool Division, Rockwell Manufacturing Co.

614B N. Lexington Avenue, Pittsburgh 8, Pa.

- Please send name of my nearest Delta Dealer.
- Please send Delta Catalog information on the new Delta 14" Metal-Wood Cutting Band Saw.
- Please send new "make up your own mind" fact book.

Name

ame\_\_\_\_\_Title\_

Company

Address\_\_\_\_

MACHINERY, February, 1956-287

# A NEW PERSPECTIVE IN PRODUCTION

# WITH LODGE & SHIPLEY Powerturn LATHES

It's time to take a new view of lathe economics. Whether the lathes in your plant are used for production or general purpose, you should be sure that they are producing as economically as possible. Lathes only a few years old may be liabilities from the standpoint of truly low cost production.

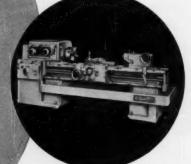
New Lodge & Shipley POWERTURN Lathes are designed in every way to facilitate turning to higher levels of profitable operation.

Among many new features is the exclusive "Dial Your Speed" head.

A dial is turned to the spindle speed required—colored pilot lights instantly indicate exact position for the speed change levers—thus eliminating operator error.

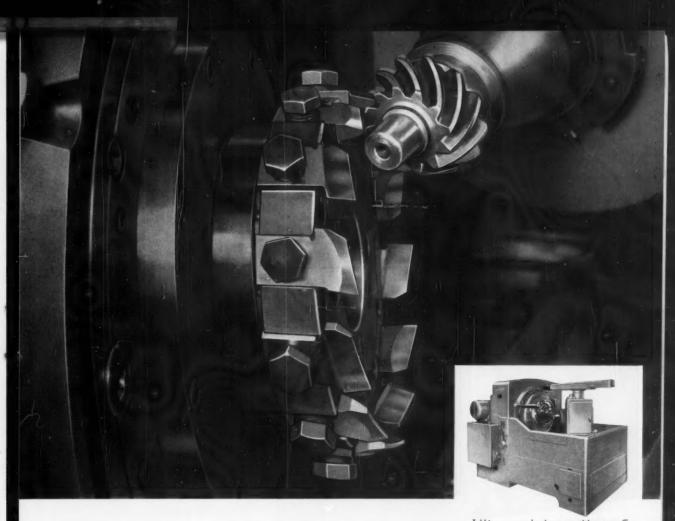
With all the new features, these Lathes offer traditional Lodge & Shipley rugged strength, power and accuracy. Get the facts now. "Up-date" lathe facilities for profitable production. Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

16" POWERTURN Engine Lathe
(also manufactured in 13" and 20"
Standard sizes, in Toolmaker, Gap,
Manufacturing and 45° and 90°
COPYMATIC models)



more than ever before . . . your LODGE-ical choice is

odge & Shipley



# This new generator Jobbing or production quantities are efficiently handled with the new Gleason No. 106 Hypoid Generator. cuts medium-size bevel gears faster than ever!

Several things have been done to make this new Gleason No. 106 Hypoid Generator the fastest machine for producing medium-size bevel gears.

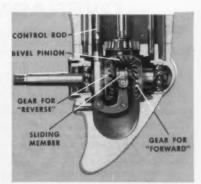
For example, new generating and feed mechanisms coupled with rigid construction give more efficient cutting cycles, speeding up cutting time. In addition, the new generating method assures excellent finish, and maximum cutter life.

Few adjustments required Since fewer adjustments are neces-

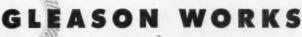
sary, faster setup and change-over are attained.

Extreme operating flexibility is one of the outstanding features of the 106. This permits its use for jobbing, production and completing. When it is arranged for completing, gears are finished directly from the solid blank.

This machine handles gears from 2'' to  $8\frac{1}{2}''$  diameter, 4DP and finer, with ratios up to 10/1, cone distances up to  $5\frac{1}{4}''$ . We will gladly send you more details on request.



Spiral bevel gears similar to those in this outboard motor drive are cut accurately and quickly on this Gleason machine.



Builders of bevel gear machinery for over 90 years 1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

# **Product Directory**

To find headings easily, look for capital letters at top of each page to denote locations.

#### ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. N. Y. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

#### ABRASIVES

See Discs, Abrasive

#### ABRASIVES, HONING

Bornes Drill Co., 814 Chestnut St., Rockford,

#### ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Macklin Co., 2925 Wildwood Ave., Jackson Norton Co., 1 New Bond St., Worcester 6, Mass. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

#### ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering
Div., Paddock Rd. and Tennessee Ave.,
Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philodelphia 42, Pa.
Bethiehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Main St.
Ansonia, Conn.
Hydropress, Inc., 350 Fifth Ave., New York 1,
Lyde File Engr. Corp. Kenmore Ste. Buffalo. N. Y.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo,
N. Y.
Vickers Incorporated Division of Sperry Rand
Corporation, 1402 Oakman Blvd., Detroit,
Mich.

AIR HOISTS-See Hoists, Air

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

#### ALLOY STEELS

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethiehem Steel Co., Bethiehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa. 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
U. S. Steel Corp., Carnegie-Illinois Steel Corp.
Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge,
Mass.

#### **ALLOY STEELS, High Temperature**

Firth Sterling Inc., 3113 Forbes St., Pittsburgh

#### ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. International Nickel Co., 67 Wall St., New York, N. Y. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### ALLOYS, Zinc

New Jersey Zinc Co., 160 Front St., New York, N. Y.

#### ARBOR PRESSES

See Presses, Arbor

#### ARBORS AND MANDRELS

ARBORS AND MANDRELS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Brown & Sharpe Mfg. Co., Providence, R. I.

Chicago-Lartobe Twist Drill Works, 411 W.

Ontario St., Chicago, III.

Cleveland Twist Drill Co., 1242 E. 49th St.,

Cleveland, Ohio.

Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.

Danly Machine Specialties, Inc., 2107 S. 52nd

Ave., Chicago 50, III.

Gorton, George Mch. Co., 1110 W. 13th St.,

Racine, Wis.

Jacobs Mfg. Co., West Hartford, Conn.

Kempsmith Machine Co., Milwaukee, Wis.

Le Count Tool Works, Inc., 390-L Capitol Ave.,

Hartford, Conn.

National Twist Drill & Tool Co., Rochester,

Mich. Hartford, Conn.
National Twist Drill & Tool Co., Rochester,
Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Shenango-Penn Mold Co., Dover, Ohio
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

(Continued on page 292)



**OVERARM** 

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keywaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4° tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

Write for Complete Specifications and Prices

GREAVES MACHINE TOOL DIVISION J. A. FAY & EGAN COMPANY 2500 Eastern Avenue, Cincinnati 2, Ohio

- Swivels permit any angular setting of spindle head.
- 2 HP Independent motor drive. 8 speeds from 175
- to 1750 RPM. Quill has 4" hand feed.
- Spindle equipped with No. 50 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in eil bath.
- Full vision oil level

RACK FEED. The overarm is equipped with rack feed for positioning over

**GREAVES MILLS** the MOST Mill for the LEAST Money!"



NEW HEAD CONTROLS make Fosmatic Radial easier than ever to run!

Numerical Dials select feeds and speeds quickly, easily, with minimum possibility of error. Select even while drill is running, to save time on next operation.

Single Control Lever starts, stops, reverses and shifts to feed and speed set on numerical dials.

Push Buttons on quick return levers engage feed. Feed is disengaged automatically by depth control or by pushing either button again. Magnetic clutch needs no adjustment.

Head Traverse Lever also elevates arm. Variable speed hydraulic motors drive both traverse screw and elevating nut. Clutches eliminated.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



Other Fosmatic features include: 36 spindle speeds,

18 feeds, 4' to 8' arms, 13" to 19" columns, Boring Type Spindle, Safety Interlocks, Variable-Tension

Counterbalance for Spindle, and optional Milling Feed.





P.S. In the Summertime with the steam off, the revolving discharge outlets produce a pleasant cooling effect . . .

the Wing Revolving Heater keep the heated air in constant gentle motion, with no steady sickening blasts of hot air on the workers, is one reason why so many firms are adopting Wing Revolving Heaters as "morale boosters". Employees in these plants work in pleasant, comfortably warmed surroundings, and being comfortable they are more productive.

Shouldn't you learn more about Wing Revolving Heaters? Just use the coupon.

DRAFT MOUCHES

## L. J. Wing Mfg. Co. 183 Vreeland Mills Road, Linden, N. J.

Wing  Wing	L. J. Wing Mfg. Co., Linden, N. J. MA-2 Please send me Bulletin HR-6A-Revolving Heaters Name. Firm. Address.	
	CityState	

#### BABBITT

Boston Gear Warks, 3200 Main St., North Quincy, Mass. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Ryerson, Jos. T. & Son, 2558 W. 16th St., Chicago 18, III.

#### BALANCING EQUIPMENT

BALANCING EQUIPMENT

American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.

Anderson Bros. Mfg. Co., 1910 Kishwaukee St.,
Rockford, Ill.

Cosa Corp., 405 Lexington Ave., New York 17.

Gisholf Machine Co. (Static and Dynamic),
1245 E. Washington Ave., Madison 10, Wis.

Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.

Olsen, Tinius, Testing Mch. Co., Willow Grove,
Pa.

Pope Machinery Corp., Haverhill, Mass.

nyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroil 7, Mich.

Sundstrand Mach. Tool Co., 2531 11th St.,
Rockford, Ill.

Thor Power Tool Co., Aurora, Illinois

#### BALLS

Kennametal, Inc., Latrobe, Pa.

#### BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves. Toledo, Ohio. Shenango-Penn Mold Co., Dover, Ohio

#### BARS, Steel

BARS, Steel

Allegheney Ludlum Steel Corp., Bethlehem, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Curuchle Steel Co., of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. Ill. St., Chicago 18, Ill. Ill. St., Chicago 18, Ill. Combridge, Market Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div. Columbia Steel Co., Div., Tennessee Coal. Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa. Wheelack, Lovejoy & Co., Inc., Cambridge, Mass.

#### BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich. Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio

#### BEARINGS, BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

#### BEARINGS, Ball

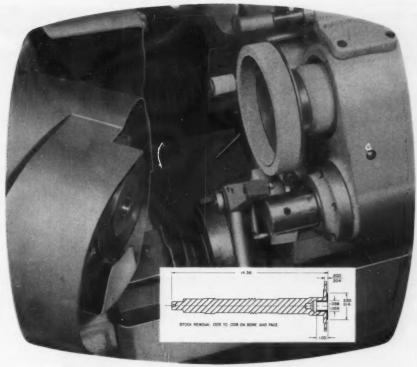
Beakings, Beil
Ball & Roller Bearing Co., Donbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
New Departure Div., General Motors, Bristol,
Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.

BEARINGS, Bronze and Special Alloy
Boston Gear Works, 3200 Main S1., North
Quincy, Mass.
Burnting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Shenango-Penn Mold Co., Dover, Ohio

#### **BEARINGS**, Lineshoft

Fafnir Bearing Co., New Britain, Conn. Orange Roller Bearing Co., Inc., Orange, N. J. Standard Pressed Steel Co., Jenkintown, Pa.

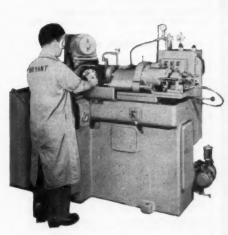
(Continued on page 294)



BRYANT INTERNAL GRINDERS

Bryant 2209-Y grinds transmission output shafts at the rate of 120 per hour.

## ... shift automatic transmission production into high!



The automatic transmissions in today's cars are designed for long-lasting, trouble-free operation. Making them so—and doing it profitably—calls for mass-producing the precision machined parts.

Bryant Internal Grinders speed production of these precision components in many ways. Combining operations — bore and face grinding simultaneously, as illustrated on output shafts — is one way.

Bryant machines have exclusive, adjustable precision alignment features that maintain life-long accuracy. They can be equipped with Bryant cost-cutting features such as the Bryant Process Controller, Bryant Air Sizing and Shoe Centerless Grinding. Put them to work for you.

Bryant offers three methods of acquisition: 1) outright purchase, 2) conditional sale (short term or long term), 3) lease.

For literature or more information on Bryant machines, special equipment and financing plans, write:



## chucking grinder co.

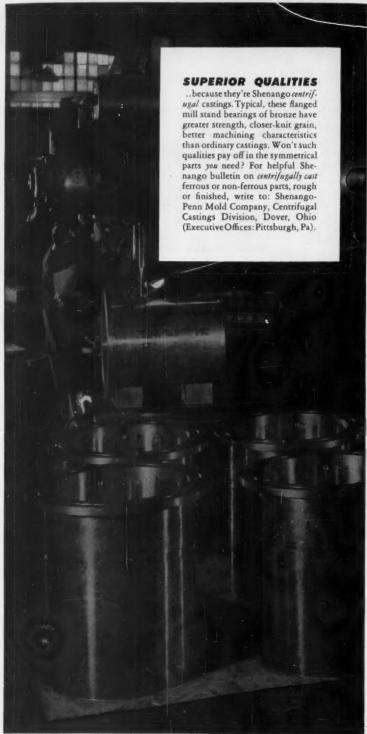
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Offices: Indianapolis · Cleveland · Chicago · Detroit · Mt. Vernon, N. Y. · Philadelphia

Internal Grinders · Boring Machines · Internal & External Thread Gages · Granite Surface Plates · Magnetic drum memory devices for computing systems

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-293





#### BEARINGS, Needle

Orange Roller Bearing Co., Inc., Orange, N. J.

#### BEARINGS, Roller

BEAN NOW, Kenler
Badli & Sciller Bearing Co., Danbury, Conn.
Fofnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St.,
Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

#### BEARINGS, Self Lubricating (Oilness)

Boston Gear Works, 3200 Main St., North Quincy, Mass. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio.

#### BEARINGS, Tapered Roller

Timken Roller Bearing Co., Canton, Ohio.

#### BEARINGS, Thrust

BEARINGS, Thrust

Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fathir Bearing Co., New Britain, Conn.,
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Shenange-Penn Mold Co., Dover, Ohio
Timken Roller Bearing Co., Canton, Ohio.

#### BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

#### **BELTING, Transmission**

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

#### BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

#### BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 656 Blossom Rd., Rochester, N. Y. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. VIII.

#### BENDING MACHINES, Hydroulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethiehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. HII.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo,
N. Y.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Wallace Supplies Mfg. Co., 1304-08 Diversey
Pkwy, Chicago, III.

#### BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy, Chicago, III.

#### BLAST CLEANING EQUIPMENT

Modern Ind., Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich. Pangborn Corp., Hagerstown, Md., Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N.Y. (Continued on page 296)



When progressive engineers at The McKay Machine Company switched from conventional heat-treating methods to TOCCO induction hardening of their mill rolls, they achieved not only increased production but also important cost savings, and perhaps most important of all, a greatly improved product.

#### 56 Times as Fast!

Formerly mill rolls required a 12-hour heat, a 15-minute salt brine quench, 12 hours tempering and a 4-hour cooling period. With TOCCO the whole job is done -and done better-in just 30 minutes-56 times as fast!

#### Here's Real Economy

Reduced furnace time saves \$28.00 per roll. More important, grinding time is cut in half (saving \$80 per roll) because TOCCO minimizes distortion and there's less stock that must be removed. Runoff used to be as much as 4"-frequently requiring a separate straightening operation.

#### THE OHIO CRANKSHAFT COMPANY

#### **Product Improved**

Because TOCCO "scans" the mill roll, i.e. heat treats it progressively, only a small section is at critical temperature at any one time. That's why distortion is minimized and little finish grinding is required. This means that TOCCO-hardened mill rolls have a more uniform case-hardened depth than possible with old fashioned methods which in turn means longer life and better performance.

Why not have a TOCCO engineer survey your plant to determine where TOCCO can reduce your costs, increase production speed and improve product quality?

- Mail Coupon Today -NEW FREE THE OHIO CRANKSHAFT CO. BULLETIN Dept. M-2, Cleveland 5, Ohio Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating. TOCCO Position Company. Address.



# Facts about Thread Rolling

it will pay you to know

Thread Rolling . . . as a Primary Operation

#### with Reed Thread Rolling Attachments on Automatic Screw Machines

Reed Thread Rolling Attachments are currently built in four popular standard sizes and designed to operate in more than 300 cross-slide positions on over 100 sizes of automatic screw machines. Each size is adjustable to accommodate an infinite range of work diameters within its capacity and consists of two units . . . a head of compact rigid design assembled to an adapter by a floating swivel connection.



## Thread Rolling ... as a Secondary Operation



#### with Reed Cylindrical Die Thread Rolling Machines

Reed Cylindrical Die Thread Rolling Machines, using three dies, have made possible interchangeable manufacture of threads on component parts where close tolerances once made selective assembly a costly requirement. Standard vertical and horizontal machines provide for a wide variety of applications on various work diameter capacities up to 4 inches.

## REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

029A

#### BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

#### **BLUING LAYOUT**

Dykem Co., 2303P. N. 11th St., St. Louis 6,

#### BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th .5t., Chicago 18, III. U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

#### BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Landis Machine Co., Inc., Waynesboro, Pa. National Machinery Co., Tiffin, Ohio. New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

#### BOLT AND NUTS

Bethlehem Steel Co., Bethlehem, Pa. National Acme Co., 170 E. 131st St., Cleveland, Ohio. Ottemiller, W. H., & Co., York, Pa. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

#### **BOOKS**, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio. McGraw-Hill Book Co., 327 W. 41 St., New York 36, N. Y.

#### BORING AND DRILLING MACHINES

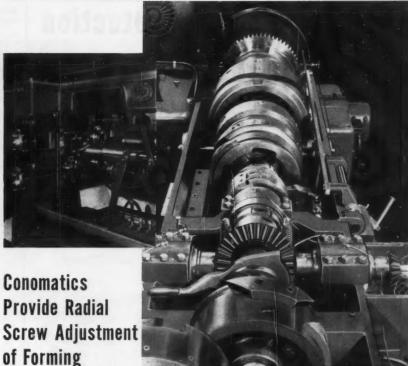
Boker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio. Boddwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Brown State St., Rockford, Ill. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn. Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue, Detroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio. Host Corp. Rockford, Ill. Michigan Drill Head Co., Detroit 34, Mich. Rockford, Ill. Michigan Drill Head Co., Detroit 34, Mich. Millholland, W. K. Machinery Co., 6402 Westfield Blivd., Indiangolis 5, Ind. Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich. Molline Tool Co., 102 20th St., Moline, Ill. Morris Machine Tool Co., 102 131st St., Cleveland, Ohio. Story Corp., North Tonawando, N. Y. Weles-Strippet Corp., North Tonawando, N. Y.

#### BORING AND TURNING MILLS, Vertical

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17.
N. York, 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Loc, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

(Continued on page 298)





Models 25%" LA, 31/2" AD, 5" KL, and 51/4" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

**Tool Slides** 

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides.

Besides the Four Spindle machines there are three quick change Six Spindle models in  $\frac{9}{16}$ , 1" and  $\frac{15}{8}$ " sizes.

Write, wire, or phone for literature.



# Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

## For Dependable Protection On Hydraulic Equipment



Over 600

Original Equipment Manufacturers Install Marvel Synclinal Filters as Standard Equipment.

SUMP TYPE (cutaway)

Hydraulic Oils MUST BE CLEAN to Protect Equipment Increase Production—
Reduce Maintenance

PRODUCTION ENGINEERS and MAINTENANCE MEN, whose job it is to keep production machinery operating at peak editiciency, are specifying Marvel Syncinal Filters on new equipment and standardising with Marvels throughout their plants.

It's The ACTIVE Filtering Area That Counts! The Synclinal design of Marve. Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage capacity for filtered out particles. Thus, longer periods of productive operation are attained before filter cleaning is necessary. Marvel Synclinal Filters are easy to clean because both the sump and line type may be discussembled, thoroughly cleaned and reassembled in matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line instellation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.



LINE TYPE (cutaway)

FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvel's most recent development is a filter for the efficient filtration of all types of Fire-resistant hydraulic fluids.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

VISIT OUR EXHIBIT — Booth #1028
TOOL ENGINEERS 1956 INDUSTRIAL EXPOSITION & CONVENTION
CHICAGO, ILLINOIS

\*\*MARCH 19 thrs 23, 1956 CHICAGO, ILLINOIS 7227 N. HAMLIN AVE., CHICAGO 45, ILL. PHONE: Juniper 8-6023 Catalogs containing complete data available on request

Without obligation, please send me complete data on Marvel Synchinal Fliters, as follows:---☐ Catalog #106—For Hydraulic Oils, Coolants and □ Catalog #300-For WATER Gatalog #200-Fer Fire-resistant hydraulie fiulds

MARVEL ENGINEERING CO.

**BORING BARS** 

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ingersoll Milling Mach. Co., 2442 Douglas St., Rockford, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffale 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

American Schiess Corp., 1232 Penn Ave., Pitsburgh 22, Pa.
Cincinnati, Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 2320 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machiner Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn.
R. R. Evanston, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homested Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Innocenti Corp., 43 W. 61st St., New York 23, N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianoplis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machiner Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. (Floor, Planer or Table Types)

BORING HEADS

BORING HEADS

Apax Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Davis Boring Tool Div., Giddlings & Lewis Machine Tool Co., Fond du Lac, Wis. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.

Mummert-Dixon Co., Hanover, Pa.

Precision Tool & Mfg. Co., 1305 S. Laramle, Cicero 50, Ill.

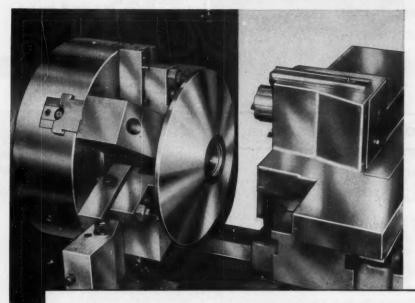
Taft-Peirce Mfg. Co., Waonsocket, R. I.

Universal Engineering Co., Frankenmuth 2, Milch.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES
Bryant Chucking Grinder Co., Springfield, Vt.
Cross Co., 3250 Believue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich.
Heald Machine Co., 10 New Bon St., Worcester 6, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Milholland, W. K., Machinery Co., 6402 Westfield Bivd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Com.
Wodell Equipment Co., 119 So. Ave., Garwood, N.J.
(Continued on page 300) BORING MACHINES (Continued on page 300)

#### ARE YOU REALLY POWERED FOR PRODUCTION?





A POTTER & JOHNSTON 4-U Automatic Chucking Turret Lathe can produce a part like this every 19.1 minutes!

PART: Transmission Wheel

MATERIAL: Nitralloy Steel Forging

REQUIRED: 2 Operations, a Total of 23 Separate Cuts including 2 Radii and a Relief Cut FIRST OPERATION ROUGH AND SECOND OPERATION MACHINE WHEEL FACE (CLEANUP CUT) TURN DIA. AND FORM 1/2" RADIUS (CLEANUP CUT) ROUGH TURN DIA. (2 TOOLS), SIZE TURN FINISH TURN MACHINE 151%" CORE DRILL PART WAY, DRILL THRU, FINISH BORE, REAM ROUGH AND - CHAMFER CHAMFER REAR OF RIM MACHINE RELIEF

ROUGH AND MACHINE SPHERICAL RADIUS (SINGLE POINT CUT WITH MULTIPLYING SLIDE TOOL ON REAR ICROSS SLIDE) MACHINE

HEAVY LINES INDICATE MACHINED SURFACES

CAN YOUR PRESENT EQUIPMENT MATCH THIS PERFORMANCE?

Check your production records. If they don't measure up to the example shown above, you're missing important opportunities for faster output and bigger profits. It takes a truly modern machine like the P&J 4-U - with the extra power, speed, rigidity and versatility needed to handle tough

alloys and complex cuts - to compete profitably in today's markets. You can't afford second-best equipment . . . so write now for full information on the finest. Ask for P&J Bulletin No. 158 describing the Potter & Johnston 4-U Automatic and including complete engineering data.

Precision Production Tooling for more than Fifty Years

#### POTTER & JOHNSTON COMPANY

PAWTUCKET, RHODE ISLAND

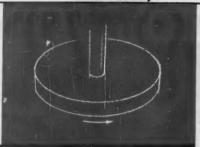
SUBSIDIARY OF PRATT & WHITNEY COMPANY, INCORPORATED

MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-299

## HOLCROFT and the ROTARY FURNACE



#### high production in small space

Production rates frequently bog down when floor space limitations prohibit large equipment purchases.

That's why—when the problem is heat treating—many companies turn to Holcroft for answers. Experience—imaginative engineering versatility of products—all team up to provide answers.

For example, the solution to the problem above could conceivably be a rotary furnace; with one or two doors for loading and unloading and a rotating hearth which carries the stock through the heat treat cycle. The hearth can be of a heat-resistant alloy or a refractory material—can be suspended from above or supported from below. Rotary furnaces can be tunnel-type, grid-type, drum-type, or rotating retort.

Of course, this is only one of the many kinds of stock handling which might be suggested by Holcroft. Your problem probably will be different and Holcroft will have the answer.

Write today for a copy of Holcroft's illustrated book:

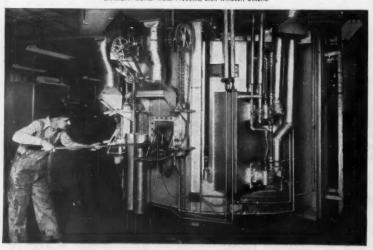
"Blazing the Heat Treat Trail." It's bound to give you food for thought.

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6545 EPWORTH BOULEVARD . DETROIT 10, MICHIGAN PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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#### BORING MACHINES, Jig

BORING MACHINES, Jig

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati Colic Corp., 405 Lexington Ave., New York 17, N. Y.

Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.

Kearney & Trecker Corp., Milwaukee, Wis.

Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.

Pratt & Whitney, West Hartford 1, Conn. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

#### BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnatir, Ohio.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

The Afrax Co. (Carbide), 240 Day St., Newington 11, Conn.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

\*\*Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich. Ex-Cell-O corp., 1200 Ookman Bivd., Detroit 32, Mich.
Firth-Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gliddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown Ohio.
Precision Tool & Mig. Co., 1305 S. Laramie, Ciccro 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Universal Engineering Co., Frankenmuth 2, Mich.
Universal Engineering Co., Frankenmuth 2,
Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

#### BRAKES, Press and Bending

Bliss, E. W., Co., 1375 Raff Road, S. W. Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio. Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferrocute Machine Co., Bridgeton, N. J. Hamilton Div. of the Lodge & Shipley Co., Hamilton I., Ohio.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

#### BRASS

American Brass Co., 25 Broadway, New York, N. Y. N. Y. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### American Broach & Mch. Co., Ann Arbor,

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelf Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Japointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

#### BROACHING MACHINES

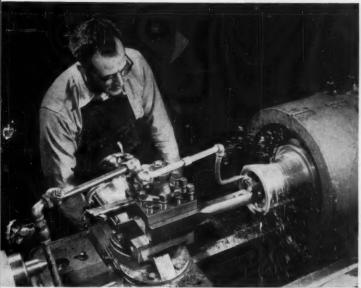
American Broach & Mch. Co., Ann Arbor, Mich. Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Breach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Detroit Broach Co., P. O. Box 156, Rochester,
Note-But Co., 130 St. Clair Ave., Cleveland
8, Ohio.

(Continued on page 302)

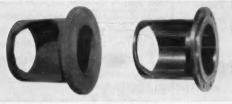
# AXELSON production and

## maintenance news

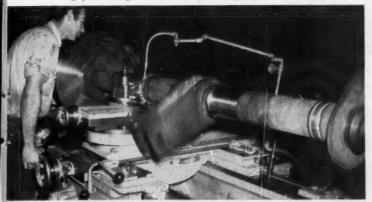
AXELSON MANUFACTURING COMPANY / DIVISION OF U.S. INDUSTRIES, INC. / 6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA



**PRODUCTION.** Heavy-interrupted roughing cuts are performed on the OD and ID of gear box support adapters on this  $20^{\circ}$  Axelson Heavy-Duty Lathe. Finishing operations include facing, turning and chamfering.



PRODUCTION PARTS. Cast steel parts for The Conveyor Company's mobile sweeper are turned, bored, faced and chamfered with carboloy tools using quick change tool block to speed roughing and finishing operations.



JOB SHOP MACHINING. 93" long axle assembly for hydraulic boom crane is rough and finish turned on this 32" Axelson Heavy-Duty Lathe, which has a 411/2" swing and a 20' bed.

#### SWEEPER MANUFACTURER **PUTS COMPLEX PARTS ON** PRODUCTION BASIS...

#### maintains flexibility for Job shop machining.

Street sweepers, conveyors, industrial scale equipment, vegetable packing machinery, batch and rock plants, are only a few examples of products manufactured by The Conveyor Company, Los Angeles, where machine tools require maximum flexibility and ruggedness combined with extreme accuracy to meet the wide range of possible applications.

Some of these products are on a production basis, such as street sweepers. Even these require maximum machine flexibility, since the sweepers have many complex and varied parts, which must be machined to close tolerances. Two typical production turning jobs are performed on 16" and 20" Axelson Heavy-Duty Lathes.

Gutter boom shaft housings, in 50-piece lots, are rough and finish turned, faced, chamfered and bored on the Axelson 16" lathe. Parts are cast steel 71/2" diameter, 10" long. Accuracy is ±.002.

The 20" Axelson Heavy-Duty Lathe is used for production of cast steel gear box support adapters. Heavy, interrupted roughing cuts are performed on the OD and ID. Other operations include rough and finish facing, turning and chamfering. Parts are 6\%" diameter, length 7\\(^1\)2" and weigh 30 lbs. Accuracy is ±.002. Carboloy tooling is used for both applications.

A 32" Axelson Heavy-Duty Lathe with a 20' bed is used for turning large shafts and other heavyduty parts for batch and rock plant applications.

For a complete description and detailed specifications on Axelson Tool Room, Medium-Duty and the new 25/16 and 32" Heavy-Duty Lathes:

Write for bulletins M2-5507-5504.









True "tool-room quality" . . . that's the way to describe the new Supreme 'Series 20" Ball Bearing Chucks. Wherever they are used . . . on drill presses, lathes, or for special jobs, they will do their work better than any similar tool in the world. Here's why:-SMOOTH, EASY OPERATION-effortless bit changes mean faster and easier work.

TIGHT GRIP-Eliminate all chance of damage to bit shanks.

EXTREME ACCURACY—The most precise chuck of its type ever built. LONGER CHUCK LIFE-Finest steels hardened by exclusive processes assure long, trouble-free service.

Supreme "Series-20" Ball Bearing

CHUCKS

Chucks are made in two sizes: Model 23T3-Capacity 0-1/2 Model 24T3-Capacity 1/8"-5%"

Supreme now makes a complete line and a quality line in every way. Order from your distributor.

Supreme Chucks

up front on America's finest

Write for catalog 274



power tools

SUPREME PRODUCTS, INC., 2222 S. CALUMET AVE., CHICAGO 16, ILL.

302-MACHINERY, February, 1956

Lapointe Mch. Tl. Co., Tower St., Hudson, Mass. Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y. Zagar Tool Inc., 24000 Lakeland Blvd., Cleve-land 23, Ohio.

#### BRONZE

American Brass Co., Waterbury 20, Conn. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleve-land, Ohio. Pittsburgh Plate Glass Co., Brush Div., Balti-more 29, Md.

#### BUFFERS

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

#### BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engra. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station,
Buffalo, N. Y.
Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.

#### BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc. Bunting Brass & Bronze Co., Spener and Carl-ton Aves., Toledo, Ohio. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York Kennametal, Inc., Latrobe, Pa. Shenango-Penn Mold Co., Dover, Ohio

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Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, III. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Leland-Gifford Co., 1925 Southbridge St., Worcester, Mass. U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa. Pa. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

#### **BUSHINGS**, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Universal Engrg. Co., Frankenmuth, Mich.

#### CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

#### CALIPERS

CALIFERS
Ames, B. C. & Co. (Dial), Waltham 54, Mass.
Brown & Si arpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave, Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y. Fellows Gear Shaper Co., Springfield, Vt. Frew Machine Co., 121 East Luray St., Philo-delphia 20, Pa. Pratt & Whitney, West Hartford 1, Conn. Sunstrand Machine Tool Co., 2351 11th St., Rockford, III.

(Continued on page 306)

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And it not only broaches slots, but this 10 hp. 42-inch stroke



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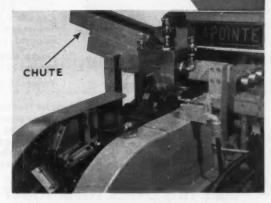
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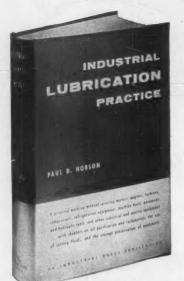


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306-MACHINERY, February, 1956

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Cincinnati Milling Machine Co., Oakley, Cincin-nati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

#### CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J. Hartford Special Machry. Co., 287 Homestead Aves., Hartford, Conn. Rowbottom Machine Co., Waterbury, Conn.

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TITANIUM AND TUNGSTEN

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich. Mercin Tool Co., 21650 Proover Long, Mich. Mich. Wesson Co., 1220 Woodward Heights Blvd., Ferndole, Mich. Wesson Metal Corp., Lexington, Ky. Willey's Carbide Tool Corp., 1340 W. Vernon Hwy., Detroit 1, Mich.

#### CASEHARDENING FURNACES

See Furnaces, Heat-Treating

#### CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Magnessum, Etc.

Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.

Bethlehem Steel Co. (Brass and Bronze only),
Bethlehem, Pa.

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

Mueller Brass Co., Port Huron 35, Mich.

Shenango-Penn Mold Co., Dover, Ohio

#### CASTINGS, DIE

American Brass Co., Waterbury 20, Conn. Madison-Kipp Corp., Madison, Wisc.

#### CASTINGS, Iron

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Chambersburg Engineering Co., Chambersburg, Pa. Pa. Shenango-Penn Mold Co., Dover, Ohio

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LASTINGS, Steel, Alloys, Etc.
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro,
Pa.
Hoynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York
U. S. Steel Corp., Columbia Steel Co., Div.,
436 7th Ave., Pittsburgh, Pa.

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Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt., Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls, Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Triplax Machine Tool Corp., 75 West St., New York 6, N. Y.

(Continued on mage 308) Baldwin-Lima-Hamilton Corp., Lima Hamilton

(Continued on page 308)



# The PRATT & WHITNEY BG-22 KELLER

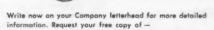
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Whatever the size—big or small—or shape—simple or complex—of the plastic parts you want, a Keller Machine can provide the capacity and ability to produce accurately, quickly, economically the dies and molds you need.

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Carboloy Dept., General Electric Co., Box 237, Roossevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St., Pitts-burgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
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St., Journ St., 21650 Hoover Ru., Super Tool Co., 21650 Hoover Ru., Mich. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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Conveyor Boston Gear Works, 3200 Main St., North Quincy, Mass. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

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Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Com.
Heald Mach., Con., 10 New Bond St., Worcestee G. Mass.
Test St., Con., 10 New Bond St., Worcestee G. Mass.
Springfield, Vt.
Natronal Acme Co., (Single and Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
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See Collets

#### CHUCKS, Diaphragm

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#### CHUCKS, Drill

CHOCKS, OH.

American Schiess Corp., 1232 Penn Ave.,
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Etteo Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.,
Jacobs Mfg. Co., West Hartford, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
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CHUCKS, Lathes, etc.

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Bullard Co., Brewster St., Bridgeport 2, Conn.

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.

Gisholt Mch. Co., Madison 10, Wis.

Horton Chuck, Windsor Locks, Conn.

Jacobs Mfg. Co., West Hartford, Conn.

Jones & Lamson Mch. Co., Springfield, Vt.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Scherr, George, Co., Inc., 200 Lafayette St.,

New York 12, N. Y.

Skinner Chuck Co., 344 Church St., New Britain, Conn.

South Bend, Ind.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Warner & Swasey Co., 5701 Carnegie Ave.,

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(Continued on page 310)

# MILLHOLLAND

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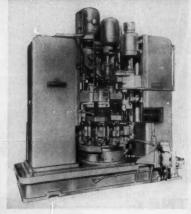
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Precision Tool & Mfg. Co., 1305 S. Laramie,
Cicero 50, Ill.
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Specialties Co., 4114 N. Knox Ave., Chicago
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Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
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Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y., Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.

Twin Disc Clutch Co., 1361 Racine St., Racine, Wils.

Verson Allsteel Press Co., 93rd St. & S. Ken-Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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COLLETS

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Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.

Cleveland Automatic Machine Co., 4932 Beech St. Cincinnati 12, Ohio.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.

New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

Tomkins-Johnson Co., Jackson, Mich.

Universal Engra. Co., Frankenmuth 2, Mich.

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

#### COMPARATORS

See Gages, Comparator.

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DoAll Co., 254 Laurel Ave., Des Plaines, III. Eastman Kodak Co., Rochester, N. Y. Jones & Lamson Mch. Co., Springfield, Vt. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

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Houghton, E. F., & Co., 303 W. Lehigh Ave.,
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International Chemical Co., 2628 N. Mascher
St., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich. (Broaching & Lopning). (Continued on page 312)

# Versatile!

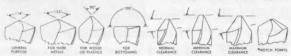


#### POINTE DRILL

- CAPACITY-3/32" TO 1/2". SPECIAL COLLET PERMITS GRINDING DOWN TO #57.
- INCLUDED ANGLES OF 80° TO 180° ARE READILY OBTAINABLE.
- CLEARANCES-SETTING GAGE PROVIDES ANY OF FOUR DIFFERENT CLEARAN-CES FOR CORRECT DRILLING.
- BUILT-IN DIAMOND WHEEL DRESSER.
- AVAILABLE IN BENCH TYPE OR PEDESTAL MODELS.

\*Modified #21 drill pointer available for adding notch points to heavy web drills.

Oliver #510 (1/4" to 3" capacity) drill pointers and Oliver point thinning machines are also supplied.



Write for brochure or send drills for sample sharpening.

# INSTRUMENT.

1410 EAST MAUMEE

OLIVER ADRIAN

ADRIAN, MICHIGAN

FACE MILL GRINDERS . AUTOMATIC DRILL GRINDERS . DIE MAKING MACHINES, TOOL & CUTTER GRINDERS . DRILL POINT THINNERS . TEMPLATE TOOL GRINDERS

# Swanson NOW OFFERS

standard, basic machine chassis for automation ... to cut costs and shorten completion time for special purpose machines.

THE AUTO-TRAN Transfer Type Indexing Unit.

Available in standard models with 48, 54, 60, 66 or 72 carriers; 3", 6", 9" or 12" index travel, and with either vertical or horizontal mounting surfaces on carriers



THE SERIES H (large) Turret Indexing Unit.

> Offered with a wide choice of turret diameters to 72"; with 8, 12, 16, 24 or 32 index positions, and a complete range of indexing rates and dwell times. Exclusive Swanson turret lock assures accurate positioning at each work station,

THE SERIES B-C (medium) Turret Indexing Unit.

> Standard models include turret diameters to 40"; 6, 8, 12, 16, 18, 24 or 32 index positions and a complete range of indexing rates and dwell times. Also features the exclusive Swanson turret lock.

If an automation program is in your present or future plans, write, wire or phone for full details on these units and other standard Swanson components and accessories.



()uality

TOOL & MACHINE PRODUCTS INC. ERIE PA

Fince 1919

ENGINEERS and BUILDERS of AUTOMATIC and SPECIAL PURPOSE MACHINES

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-311

Single set-up covering ALL finishing operations...



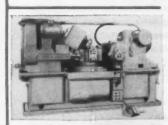
MEANS **GREATER ACCURACY** with GOSS DELEEUW







## AUTOMATIC CHUCKING MACHINES



One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & De Leeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.



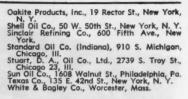
In Goss & De Leeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

DELEEUW

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost

GOSS and DE LEEUW

MACHINE COMPANY, KENSINGTON, CONN., U.S.A.



#### COMPOUNDS, Resin and Molding

General Electric Co., Schenectady 5, N. Y.

#### COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

#### CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

#### CONTRACT WORK

CONTRACT WORK

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y. Corp., 920 N. Belden Ave., Warren, Ohio.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Fellows Gear Shaper Co., Springfield, Vt. Hartford, Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett, Lothe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford, Ill.
Netfield Corp., 721 Springfield St., Dayton 1, Ohio.
St. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wicaco Mch. Corp., Wayne Junction, Philadel-phia, 2a.

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee. Clark Controller Co., Cleveland, Ohio. General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford,

#### **COOLANT SEPARATORS**

See Separators, Oil or Coolant

#### COOLANT SYSTEMS

Gray-Mills Co., 1948-52 Ridge Ave., Evanston,

American Brass Co., 25 Broadway, New York, N. Y. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### COUNTERBORES

COUNTERBORES

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(Continued on page 314)



Wrap" has leaped from 130,000 rolls to 4,000,000 rolls a month since 1951. This up-swing is due to a new plant, a new flow system, and additional equipment including new START AND STOP CYCLES OF AUTOMATIC machinery equipped with Reliance V\*S Drives. One of the most dramatic applications of V\*S Drives is on the final wrapping machines shown here. The drives must be able to start, accelerate to 3500 rpm., and stop more than 20 times a minute.

> The most important feature, though, is not the frequent starts and stops, but the delicately controlled acceleration of the drives. "Saran Wrap" is only 1/6th as thick as a human hair, and sharp or jerky starts will cause a break in the sheet and halt production. Reliance Drives do the job day in and day out without a single break due to uncontrolled acceleration.

> This feature of V $\star$ S Drives, called *Dynamic Response*, is only one of the many facets of Reliance Drives. V $\star$ S Drives can regulate tension, synchronize operations, control speed rates, and automatically program speed changes.

> Whether you handle a thin film of plastic or steel billets, on a complete production line or a single machine, Reliance can give you better quality, more production, and lower costs through Variable Speed Drives.

> > Write for bulletin D-2311.



CONDS

WRAPPING MACHINE DRIVE

RPM

3000

2000

1000

#### ECTRIC AND ENGINEERING CO.

OFFICES IN PRINCIPAL CITIES Canadian Division: Welland, Ontario



Yes, you can - but it's not necessarily the best thing for you.

You want the lowest unit cost for the life of the part, including re-runs. It may well be that our Machine-Cut Method, with no die cost, does work out best.

Or, it might better be our Short Run Method, using economical blanking dies and stock punches.

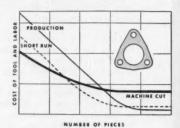
Sometimes, even with very short runs, it pays to use our Production Method with a standard die or our own surprisingly inexpensive Hecht-type tool.

In any case, the decision is a technical one based on many factors, not just length of run. You save money when the correct decision

#### WE USE ALL THREE METHODS - LET US MAKE AN IMPARTIAL DECISION FOR YOU

For example, take the part illustrated. From 1-65 parts, our Machine-Cut Method is most economical. At 65 parts, the Short-Run Method is best until, at 7,000 units, the standard Production Method is most satisfactory.

These breaking points as charted vary drastically with every stamping, but the general principle remains the same.





#### STAMPINGS DIVISION

ONE PIECE OR ONE MILLION

1902 Union Street, Glenbrook, C	Conn.	
Gentlemen:		
Please rush me my free illustrated booklet full of	copy of "SERVICE IN STA. helpful facts on the economic	MPINGS"—the 12-page, cal buying of stempings.
NAME	TITE	LE
COMPANY		

#### **Product Directory**

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Kennametal, Inc., Latrobe, Pa. National Twist Drill & Tool Co., Rochester, Mich. Pratt & Whitney, West Hartford 1, Conn. Scully-lones & Co., 1903 Rockwell St., Chicago 8, Ill. Starrett, The L. S., Co., Athol, Mass. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Threadwell Top & Die Co., Greenfield, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

#### COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

#### COUNTERSINKS

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Wis.

Wis.

Chicago-Latrobe Twist Drill Works, 411 W.

Chicago-Litrobe Twist Drill Works, 411 W.

Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. 1.

Cleveland Twist Drill Co., 1242 E. 49th St.,

Cleveland, Ohio.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

Ex-Cell-O Corp., 120 Oakman Blvd., Detroit

32, Mich.

Greenfield Tap & Die Corp., Greenfield, Mass.

Haynes Stellite Div., Union Carbide & Carbon

Corp., 30 E. 42nd St., New York.

National Twist Drill & Tool Co., Rochester,

Mich. Mich. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### **COUNTERS, Revolution**

Brown & Sharpe Mfg. Co., Providence, R. I. Millers Falls Co., Greenfield, Mass. Starrett, The L. S., Co., Athol, Mass.

#### COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

#### COUPLINGS, Flexible

Boston Gear Works 3200 Main St., North Quincy, Mass. Con-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn., Philadelphia Gear Works, Erle Ave., and G St., Philadelphia, Pa.

#### **COUPLINGS**, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Standard Pressed Steel Co., Jenkintown, Pa.

#### CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

#### CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc. (Continued on page 316)

# Boding CASE HISTORY NO. 42



SPOTLIGHTS VERSATILITY
OF BODINE METHODS

This is but one of many ways in which versatile, timetested Bodine basic machines and units can be teamed to create high-speed, cost-cutting assembly units without resort to costly "specials."

Note especially the ease and convenience with which auxiliary equipment (in this case automatic hopper feeds) can be grouped around the Bodine "chassis." Note also the high production and close limits maintained on this day-in, day-out production line job for one of the world's largest automobile manufacturers.

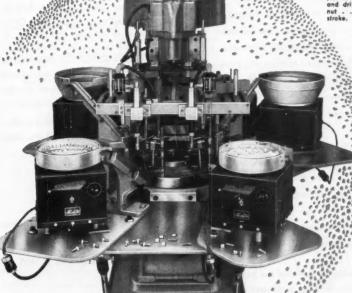
PRODUCTION: 3,000 completed assemblies per 50minute hour. Machine speed, 30 strokes per minute.



Unthreaded molded nylon nut hopper-fed and transferred to the dial fixture 2 pieces per stroke.



Adjusting screws hopper-fed, transferred and driven into nylon nut . . 2 pieces per



Auto eject completed ossembly. Depth of screw driving held consistently within ½ turn in untapped nut.

Write Dept. M-2

If high-speed, low-cost assembly is one of your problems . . . in metals, plastics, or a combination of both . . , with or without concurrent machine operations . . . check first with Bodine. The possibilities of our methods are practically unlimited.

BODING
CORPORATION
ENDERFORTS, CONNECTICUTY

AUTOMATIC BIAL TYPE DEILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

-

For more information fill in page number on inquiry Card, on page 245

MACHINERY, February, 1956-315

CARBIDE TIPPED Cast Iron, Cast Steel and Other Hard Non-

**Ferrous Materials** 

CARBIDE-MASONRY

Material

**FASTWIST** 

Aluminum.

SLOWTWIST

**Plastics** 

Zinc, Magnesium and other Die Cast Materials

Copper

CARBIDE-GLASS

Concrete, Brick, Mar-

ble, Slate, Stone and all types of Masonry



breakage!

The cost saving features of W & B drills . . . and "There's A Big Difference"... are the result of over 100 years of research, experience and engineering. So for faster, better, more economical drilling, specify W & B quality drills!

For quality service and the best in drills, call your W & B distributor today! For literature or additional information, write direct

Are you looking for a better drillone that will cut costs in your drilling operation? Whitman & Barnes manufactures a complete line of drills for non-ferrous materials that are specifically designed to give you increased production . . . more holes per grind . . . longer drill life . . . less drill

Bakelite, Brass, Fiber, Hard Rubber and vari-ous types of Molded

"Makers of Jine Tools Since 1848"

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Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. field, Vt.
Glean Works, 1000 University Ave., Rochester3, N.Y.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Broach & T. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Waltham Mch. Works, Newton St., Waltham,
Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

**CUTTERS**, Keyseater

Davis Keyseater
Davis Keyseater Co., 405 Exchange St., Rochester & N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
du Mont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Defroit
32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

**CUTTERS**, Milling

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carbolay Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pitts-burgh 30, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoil Milling Mch. Co., 2442 Dauglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennameral, Inc., Latrobe, Pa.
Motch & Merryweather Mchry Co., Penton
Bidg., Cleveland, Ohio.
National Twist Drill & Tl Co., Rochester, Mich.
Praft & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Tomkins-Johnson Co., Jackson, Mich. Mich. Tomkins-Johnson Co., Jackson, Mich. Wesson Co. 1220 Woodward Heights Blvd, Wesson Co. 1220 Woodward Heights Blvd,, Ferndale, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

**CUTTERS, Rotary** 

See Files & Burrs Rotary

**CUTTING COMPOUNDS** 

See Compounds, Cutting, Grinding,

**CUTTING AND GRINDING FLUIDS** 

CUTTING AND GRINDING FLUIDS
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York,
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, III.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III.
Stuart, Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

**CUTTING-OFF MACHINES** 

Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio. Brown & Sharpe Mfg. Co., Providence, R. I. Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type). Consolidated Mch. Tool Co., Rochester, N. Y. (Continued on page 318)

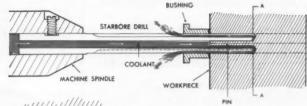
# A REVOLUTIONARY NEW TOOL FOR PRODUCING PRECISION HOLES IN STEEL, CAST IRON, ALUMINUM and IRONZE

FEEDS UP TO 60-IN. PER MINUTE

Starbore carbide drills produce smooth, ultraprecision, through-holes from the solid at extremely high production rates. Hole tolerances of 0.0002-in. and surface finishes as smooth as 4-rms can be consistently produced at 15-ipm feed. These efficient, long-life patented\* drills have a hollow circular carbide steel tip brazed to a tubular steel shank. An off-center hole through the drill permits the two or more carbide cutting edges to produce a small pin during the cutting process, thus providing a tool with the combined advantages of an oil-flute drill and a trepanning tool.

\*U. S. Patent No. 2,674,908





SECTION A-A (ENLARGED)



Coolant directed under pressure to the cutting edges through the off-center hole flushes out chips through flutes along the shank.

For complete details write for Starbore Engineering Data Folder SC-27 See Starbore in Action at the ASTE Industrial Exposition International Amphitheatre Chicago, March 19-23, 1956

**BOOTH 1329** 

Ottor Cutter Company

34500 GRAND RIVER AVENUE, FARMINGTON, MICHIGAN

ORIGINATORS OF ACCURATE UNGROUND FORM HOBS

TELEPHONE: DETROIT, KENWOOD 3-4500





MACHINERY, February, 1956-317



# operating steps...Because IT'S MOTORIZED

· Here is the motorized operating procedure made possible by the new wilson "Rockwell" Y Model Motorized Hardness Tester-

Place specimen upon anvil or table.

2 Elevate test piece into test position. (With the new Set-O-Matic Dial Gauge, the large pointer will then automatically point to zero.)

3 Tap depressor bar to apply Major Load. When Major Load is fully applied, the Motorized Mechanism takes overcompletes the test cycle-removes the Major Load.

4 Read "Rockwell" Hardness Number. Then, lower elevating screw to remove test piece.

For complete information about the WILSON Y Model, or any others of the complete line of WILSON "Rockwell" Hardness Testers, write or call today. A WILSON hardness testing expert is available to consult on your specific requirement. \*Trade mark registered



(1) Affords clear and easy (1) Affords clear and easy reading. Readings are easily taken wherever your "Rock-well" Tester is located— whatever the lighting condi-tions of the room.

Indenter light (2) is directed towards the test area, making it easy to locate the exact area of test at all times.



# Set-O-Matic Dial Gauge

The Set-O-Matic Dial Gauge increases the accuracy of the test, makes the test cycle shorter and increases the number of read-ings obtainable within a definite period of time.



### CUTTING-OFF MACHINES, **Abrasive Wheel**

Campbell Machine Div., American Chain & Cable, Bridgeport, Conn., Hamilton Div., The Lodge & Shipley Co., Hamilton I, Ohio. Wallace Tube Co., 1304-08 Diversey Pkwy., Chicago, III.

# CUTTING-OFF MACHINES, Cold Sow

See Sewing Machines, Circular

## CUTTING-OFF MACHINES, **Metal Band Saws**

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicogo, IIII. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Johnson Mfg. Co., Albion, Mich.

# **CUTTING-OFF TOOLS**

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Armstrong Bros. Tool Co., \$200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland Tay. Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo.

# **CUTTING-OFF WHEELS, Abrasive**

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# CYLINDER BORING MACHINES

CTLINDER BORING MACHINES
Baker Bros., Inc., Sta. F, Box 101, Toledo
10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Ingersoll Milling Mch. Co., 2424 Douglas St.,
Rockford, Ill.
Michigan Drill Head Co., Detroit 34, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.

# CYLINDERS, Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Tomkins-Johnson Co., Jackson, Mich.

# CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, III. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Logansport Machine Co. Inc., 810 Center Ave.,
Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Wis. Wis.
Rivett Lathe & Grinder, Inc., Brighton, Beston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill., Shenango-Penn Mold Co., Dover, Ohio Tomkins-Johnson Co., Jackson, Mich., Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

# CYLINDERS, Pneumatic

Shenango-Penn Mold Co., Dover, Ohio

# **DEALERS**, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y. N. Y. Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. (Continued on page 320)

Wilson Mechanical Instrument Division

# **AMERICAN CHAIN & CABLE**

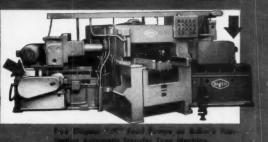
230-D Park Avenue, New York 17, N. Y.

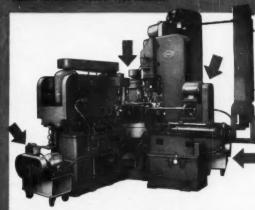


# OILGEAR "JK" FLUID POWER FEED PUMPS



and the second s





AS APPLIED TO

BAKER BROTHERS MACHINES

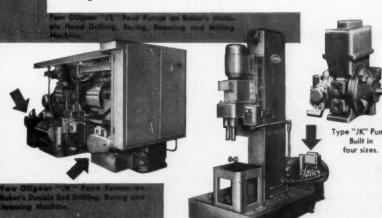
HOW CAN YOU USE THESE SIMPLE, VERSATILE, EASILY APPLIED, PROFITABLE UNITS?

Baker Brothers, Inc., pioneers in machine building, users of Oilgear Feed Pumps since 1925, employ Oilgear "JK" Fluid Power Variable Delivery Feed Pumps on a host of machines including the headline-making 100-foot-long transfer machine and their own commercially available portable hydraulic power unit which you can see in photos Nos. 1 and 3 on this page.

The Oilgear "JK" Feed Pump offers many advantages, not the least of which are easy applicability and accessibility. There's no need in many cases for machine redesign and engineering. And this unit does so much to speed cycle time—traverse speed for example can be 265 times feed rate—that production rises dramatically and costs subside. Both coarse and fine feed rates can be varied infinitely so you at once discover the best rates for your work—and the automatic built-in compensator holds the selected fine feed unvaryingly. All functions are controlled automatically, semi-automatically or manually.

Evidence of Oilgear "JK" dependability is growing. In one large automotive plant, now 75% changed over to Oilgear, hydraulic maintenance staff was cut from 6 men to one man per shift. In another great automotive plant, the records show Oilgear is found to give the finest service of all.

There's much more to tell especially about two new units added to the "JK" line. Why don't you send for free literature that gives all the facts and figures. So you won't forget, send for it now.



THE OILGEAR COMPANY

1569 W. PIERCE STREET MILWAUKEE 4, WIS.



PIONEERS . . . NOW THREE PLANTS
FOR FLUID POWER

PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS AND VALVES



# efficient and dependable operation of your machines and machinery

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Pratt & Whitney, West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
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Snyder Tool & Engrg. Co., 3400 E. Lafayette,
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Rockford, III.
Turchan Follower Machine Co., 8259 Livernois
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See Castings, Die

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Clearing Mch. Corp., Div. U. S. Industries, Inc.
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Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

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Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
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Metal Carbides Corp., Youngstown, Ohio.
Moore Special Tool Co., Inc., 724 Union Ave.,
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St., Cincinnati 9, Ohio.
Errington Mechanical Laboratory, 24 Norwood
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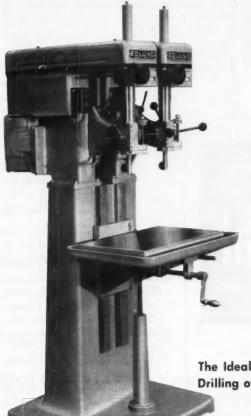
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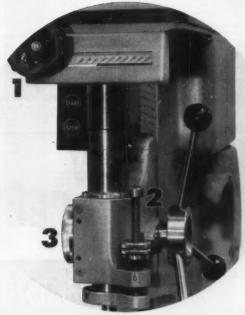
(Continued on page 326)

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H. P. Townsend Mfg. Co., Elmwood, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio. Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Cincinnati Gibert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio. Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio. 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland,
Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.

# DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.

# DRILLING MACHINES, Roil

See Drilling Machines, Gang

# DRILLING MACHINES, Sensitive

Atlas Press Co., Kalamazoo, Mich. Avey Drilling Mch. Co., 26 E. Third St., Cov-ington, Ky. Buffalo Forge Co., 490 Broadway, Buffalo, Buffalo N. Y. N.Y.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9 Ohio.
Cosa Corp., 405 Lexington Ave., New York To., N.Y.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio. B, Ohio.

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DRILLING MACHINES, Upright
American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
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Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Bausch Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
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N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Edlund Machinery Co., Cortland, N. Y.
Edlund Machinery Co., Cortland, N. Y.
Cosa Corp., 405 Lexington Ave., Cleveland 8, Ohio.
Posdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Letand-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, III.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, III.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

# DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y.

# **DRILLS Center**

The Afrax Co. (Carbide) 240 Day St., Newington 11, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Onfario St., Chicago, III. (Continued on page 328)





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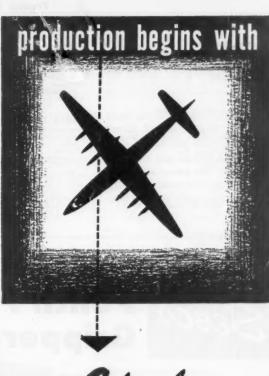
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Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.
Whitman & Barnes, 40600 Plymouth, Rd.,
Plymouth, Mich.

# DRILL, Core

Ace Drill Corp., Adrian, Michigan. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

32, Mich. Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Po. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Super Mich. Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndole, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hay., Detroit 1, Mich.

DRILLS, Deep Hole

Ace Drill Corp., Adrian, Michigan.
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
National Twist Drill & Tool Co., Rochester,
Mich.

National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Star Cutter Co., Farmington, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Portable Electric

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Millers Falls Co., Greenfield, Mass. Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati Ohio. Ther Power Tool Co., Aurora, Illinois

**DRILLS, Portable Pneumatic** 

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 9, N. Y. Inyersoll-Rand Co., Phillipsburg, N. J. Thor Power Tool Co., Aurora, Illinois

**DRILLS, Rachet** 

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Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich. Mich.

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Mithum & Barnes, 40600 Plymouth Rd.,

Plymouth, Mich.

# **DRILLS**, Subland

Ace Drill Corp., Adrian, Michigan. Mohawk Tools, Inc., 910 E. Main St., Mont-pelier, Ohio. National Twist Drill & Tool Co., Rochester, Whitman & Barnes, 40600 Plymouth Nd., Plymouth, Mich. Mich.

# DRILLS, Twist

Ace Drill C3rp., Adrian, Michigan.
The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Deany-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

# DRILLS, Wire

Ace Drill Corp., Adrian, Michigan.
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Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth, Rd., Plymouth, Mich.

# **DUPLICATORS**

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# DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.

# DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md. (Continued on page 330)



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Here's what Burnham Finney, distinguished editor of American Machinist, says about "H C & S": "O utstanding for its clarity of expres-



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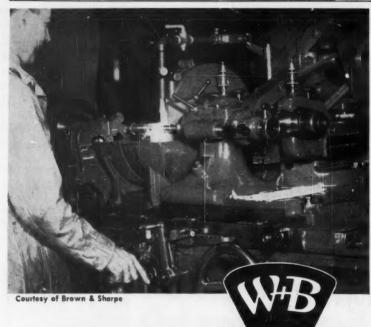
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Greenfield Tap & Die Corp., Greenfield, Mass.
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Although Inc., 910 E. Main St., Monta-pelier, Ohio.
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Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
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(Continued on page 332)

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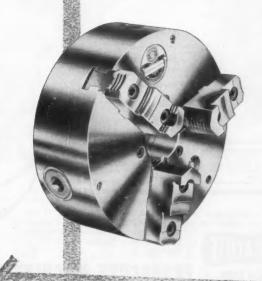


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Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnoti Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N.E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
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Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.

Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.

III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Nlagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave.,
Kenton, Ohio
Verson Altsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Wallace Supplies Mfg. Co., 1304-08 Diversey
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Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

# FRAMES, Machinery Welded

Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Mahon, R. C. Co., Detroit 34, Mich. Verson Allsteel Press Co., 93rd St., & S. Ken-wood Ave., Chicago, III.

# **FURNACES**, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

# FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

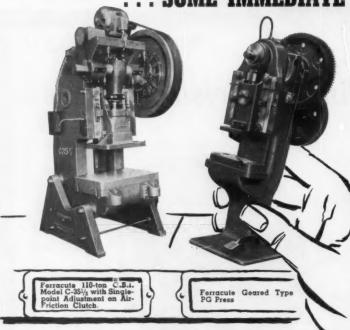
# **GAGE BLOCKS**

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc. 200 Lafayette St.,
New York 12, N. Y.
Taft-Peirce Mfg. Co. Woonsocket, R. I.

# GAGES, Air

GAGES, Air
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Taff-Peirce Mfg. Co., Woonsocket, R. I.
(Continued on page 334)

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illustrated —  $13'' \times 5'$  bed Toolroom Lathe, less motor and controls, f.o.b. factory.

12049

# for accurate, low-cost machining

South Bend 13" Lathes are popular where there is a variety of precision parts to be machined. Costs drop as their accuracy and efficiency keep production flowing fast even on the "headache" jobs. Operators prefer them for their simplicity and practically effortless handling. Also, set-ups and change-overs are made so quickly and easily that down-time is held to a minimum.

Now is the time to find out how these quality-built lathes can also bring you better machining at lower costs. Let your near-by South Bend distributor show you how they can ease your production, toolroom and maintenance machining problems. Or, mail coupon for literature on the 13" Toolroom and Quick Change Gear models.

# SPECIFICATIONS

Swing—131/8" over bed and saddle wings, 8" over saddle cross slide.

Distance Between Centers—28¼", 40¼" and 52¼".

Collet Capacity—1" maximum (collets interchangeable with 10"–1", 14½", 16" and 16–24" South Bend lathes).

Spindle Bore—1¾".

Spindle Speeds—Eight; 40, 60, 90, 135, 270, 418, 628 and 940 r.p.m. approx.

Longitudinal Feeds—48 R.H. or L.H., .0015" to .0841". Cross Feeds—48, .0006" to .0315".

Thread Cutting—48 R.H. or L.H. pitches, 4 to 224 per inch



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BENCH LATH

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1 1 Collet
TURRET LATHES

TOOL 7" BEN

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# GAGES, Comparator

GAGES, Comperator

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Cleveland Instrument Co., 735 Carnegie Ave.,
Claveland 15, Chio.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAlf Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1327, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Iric., 200 Lafayette St.,
New York 12, N.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y. Onlo. Standard Gage Co., Inc., Poughkeepsie, N. Y. Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Ames, B. C., Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III.

Products Corp., P.O. Box 1027, Provide r.s., R. I.

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Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Stationard Gross Co., Inc., Pountkeersie, N. Y. Onio. Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

# GAGES, Dial

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. 1.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. 1.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N.Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.

Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass, Taft-Peirce Mfg. Co., Woonsocket, R. I.

# GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DOAII Co., 254 Lourel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

# GAGES, Height

Ames, B. C., Co., Waitham 54, Mass.
Brown & Sharpe Mtg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave.,
Cleveland 15, Ohio.
DoAil Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Soginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Ohio. Starrett, The L. S., Co., Athol, Mass.

# GAGES, Plug, Ring and Snap

GAGES, Plug, Ring and Snap
Besty-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Elgin National Watch Co., Aurora, Ill.
Federal Products Corp., Po. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hoynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney, West Hartford I, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N.;
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Size Control Co., 2500 W. Washington Blvd.,
Chicago 12, Ill.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taff-Peirce Mfg. Co., Woonsocket, R. I.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit I, Mich.
Winter Bros. Co., Rochester, Mich.

# GAGES, Surface

Ames, Surrace

Ames, B. C., Co., Waltham 54, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.

Columbus Die-Tool & Mch. Co., 955 Cleveland

Ave., Columbus, Ohio.

DoAll Co., 254 Laurel Ave., Des Plaines, III.

Lufkin Rule Co., Hess Ave., Saginaw, Mich.

Millers Falls Co., Greenfield, Mass.

Sheffield Corp., 721 Springfield St., Dayton 17,

Ohio. Ohio. Starrett, The L. S., Co., Athol, Mass.

# GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taff-Pairce Mfg. Co., Woonsocket, R. I.

# GAGES, Thread

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besty-Weltes Corp., 12 Coannes, III.
Vis.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Size Control Co., 2500 W. Washington Blvd.,
Chicago 12, III.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Winter Bros. Co., Rochester, Mich.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Garlock Packing Co., Palmyra, N. Y.

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Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. General Electric Co., Schenectady 5, N. Y.

# GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. (Continued on page 336)

# The **NEW** provides COMPLETE 200/-2 with two vertical AUTOMATION spindles. DIE SINKING



Turbine blade forging die.



# Greater Accuracy and Higher Finish Speed Up Production, Reduce Bench Time

The new RIGID die sinking and copy milling machines are hydraulically operated and fully automatic. RESULT—greater production speed, less operational supervision. And the high finish produced by these Swiss-made machines reduces time-convenience back with the convenience back with the supervision back with reduces time-consuming hand work to an absolute minimum.

The surface travel of the cutter remains constant regardless of variation in contour. Even vertical copying can be performed easily. RIGID Die Sinkers will maintain a normal working accuracy of ±.00211 from master to work piece. Closer tolerances are also possible.

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ROLLS: Steel, Alloy Iron, Alloy Steel

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BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-335

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,

# GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

BURRING MACHINES

American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
Bilgram Gear & Mch Works, 1217-35 Spring
Garden St., Philadelphia, Pa.
Consolidated Ach Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 306 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood,
Detroit 4, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.

## GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I. Eastman Kodak Co., Rochester, N. Y. Fellows Gear Shaper Co., 78 River St., Springfield, Vt. Gleason Works, 1000 University Ave., Rochester 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Notional Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Starreft, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

# GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

# GEAR CUTTING MACHINES

Bevel Gears, Spiral
Gleason Works, 1000 University Ave., Rochester 3, N. Y. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

# GEAR CUTTING MACHINES, Spur and **Bevel Gears (Rotary Cutter)**

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Waltham Machine Works, Newton St., Wal-tham, Mass.

# GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

American Schless Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Barber-Colman Co., Rock and Montague, Rock-ford, III. Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio. Hamilton Tool Co., 654 3.

Chio.

Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.

New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hilside, N. J.

Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

# GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Felical Gears (Snaper or Planer Typo)
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

# GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rock-ford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171
E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Spring-field Vt. (Straight and Hourglass Types).
Lees-Bradner Co., Cleveland, Ohio.

Michigan Tool Co., 7171 E. McNichols Rc Detroit 12, Mich. New Jersey Geor & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

## GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. field, Vt. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

### GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Genr Grinding Machine Co., 3901 Christopher
St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohió.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

# GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

# GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

# GEAR MOTORS

See Speed Reducers

# GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

# GEAR TESTING MACHINERY

GEAR TESTING MACHINERY

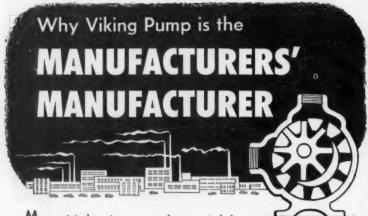
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodok Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Snaper Co., 78 River St., Springfield, Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio,
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

# GEARS. Cut

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring
Garden St., Philadelphia, Po.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Brad Foote Gear Works, 3309 So. Cicero Ave.,
Chicago 50, Ill.
Chicago Rawhide Mfg. Co., 1301 Elston Ave.,
Chicago 22, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200
E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave.,
Syracus, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birminghom Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.
Greaves Mochine Tool Co., 2009 Eastern
Avenue, Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead
Ave., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Illinois Gear & Mch. Co., 2120 No. Natchez
Ave., Chicago 35, Ill.
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
(Continued on page 338)

(Continued on page 338)



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# KING PUMP COMPANY Cedar Falls, Iowa, U.S.A.

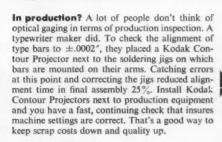
In Canada, it's "ROTO-KING" pumps ORIGINAL "GEAR - WITHIN- A - GEAR" ROTARY PUMP

# How many places in your plant can projection gaging save time and money?



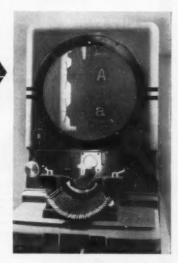
In the toolroom? Look at this. Prior to adopting projection gaging, a Midwestern manufacturing plant required 725 man-hours monthly to inspect flat drills, taps, special cutters, and circular form tools. Use of a Kodak Contour Projector reduced inspection time 84% to 115 man-hours; cost of the projector was returned in direct labor savings within three months. If you have a heavy inspection load in your toolroom, chances are that optical gaging with Kodak Contour Projectors could effect similar savings for you.

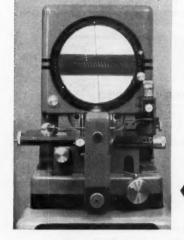
In receiving? Here's the experience of a leading maker of aircraft engines. Their gaging procedure on jet engine blades called for inspecting 11 dimensions (including radii and angles) on the dovetail contour, 14 additional dimensions on the blade root. Using two Kodak Contour Projectors, they checked these pieces at a rate of 150 per hour. And operators required little training. What about your receiving inspection department? Couldn't a fast, highly accurate method of inspecting all sorts of parts with multiple dimensions and complex shapes help prevent bottlenecks?



In final inspection? Ever have a part that was almost impossible to inspect accurately and completely? A leading West Coast electronics manufacturer did. They had to check the precise pitch of a fine wire helix mounted in its glass tube. "Without the Kodak Contour Projector," the company reported, "it would not be practical to make the measurements necessary to get a satisfactory instrument." Many times optical gaging on a Kodak Contour Projector lets you measure small or easily distorted parts with a simplicity and accuracy you can't achieve by other methods.







WHATEVER your inspection or measuring problem, there's a Kodak Contour Projector to do the work, from the bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity. To find out more about how optical gaging can save you time and money, improve accuracy, send for the booklet, "Projection Gaging with Kodak Contour Projectors." Write Special Products Sales Division.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.
the KODAK CONTOUR PROJECTOR



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GEARS, Rawhide and Non-Metallic Boston Gear Works, 3200 Main St., North

GEAK), Rawhide and Non-Metallic Boston Gear Works, 3200 Main St., North Quincy, Mass. Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill. Cincinnati Gear Co., Wooster Pike and Marle-mont Ave., Cincinnati, Ohio. Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.

Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hortford Special Mchry, Co., 287 Homestead Ave., Hortford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa., Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS. Electric

General Electric Co., Schenectady 5, N. Y. Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio. Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

# GRADUATING MACHINES

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.

### GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y. No.

No.

No.

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

Lubriplate Div., Fiske Bros. Refining Co., 129

Lockwood St., Newark S. N. J.

Shell Oil Co., 50 W. 50th St., New York, N. Y.

Sinclair Refining Co., 600 5th Ave., New York, N. Y.

Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III.

Sun Oil Co., 1608 Walnut St., Philadelphia, Texas Co., 135 E. 42nd St., New York, N. Y.

# GRINDERS, Carbide Tool

See Grinding Mches., Carbide Tool

# GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

# GRINDERS, Oilstone, for Woodworking

Mummert-Dixon Co., Hanover, Pa.

# **GRINDERS**, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Madison-Kipp Corp., Madison, Wis. Thor Power Tool Co., Aurora, Illinois

# GRINDERS, Portable Electric and Toolpost

GKINDEKS, Portable Electric and Loolpost Chicago Pneumatic Tool Ca., 6 E. 44th St., New York, N. Y. Millers Falls Co., Greenfield, Mass. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Ther Power Tool Co., Aurora, Illinois

# GRINDING FIXTURES

Geometric Tool Co., (Die Chaser), Westville Station, New Haven 15, Conn. Taft-Peirce Mfg. Co., Woonsocket, R. I.

# **GRINDING MACHINES, Abrasive Belt**

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.
Mattison Mch. Works, Rockford, III.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati, Ohio.
Walls Sales Corp., 333 Nassau Ave., Brooklyn
22, N. Y.

# GRINDING MACHINES, Bench

GRINDING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati, Ohio.
U. S. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

# GRINDING MACHINES, Broach

Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich. Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

# GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Warcester 6,

(Continued on page 340)

# LOOK AT THIS UP-TO-THE-MINUTE EXHIBIT OF

# POPE PRECISION SPINDLES

# EXHIBIT A

POPE SUPER-PRECISION, HEAVY DUTY BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for avotations.



# EXHIBIT B



POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

# EXHIBIT D



POPE HEAVY DUTY, 4 TO 100 HP DIRECT MOTORIZED

Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations



POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, 1/2 to 50 HP

# EXHIBIT G

POPE INTERNAL GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.



NEW POPE QUICK, SELF-REMOVING WHEEL HOLDER

for surface grinders and tool and cutter grinders — elimi-nates the necessity of a wheel puller. Write for quotations,

# EXHIBIT E



POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for Angular Adjust-Heads for Angular Adjust-nt In A Vertical Plane

# EXHIBIT H



POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES for speeds up to 100,000 RPM

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

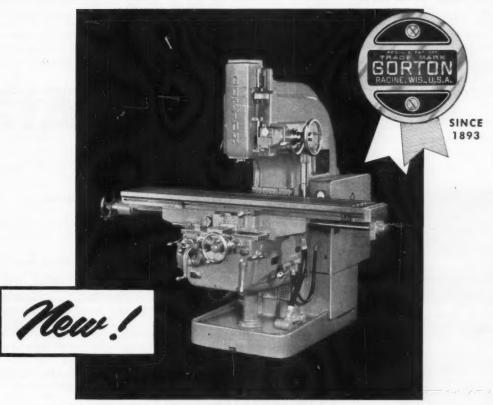
# Specify

PRECISION SPINDLES

POPE MACHINERY CORPORATION

261 RIVER STREET . HAVERHILL, MASSACHUSETTS

# GORTON PRESENTS A Winner!



NEW GORTON 3-48 VERTICAL MILL

# **Check Your Requirements and These Features**

- 1. 76" table with 48" table travel.
- 2. Extended saddle with hardened inserts.
- 3. Fullwidth knee with 241/2" bearing spread.
- 4. Square lock bearing guides.
- 5. 10 H.P. Spindle motor drives spindle only.
- 6. 36 spindle speeds from 25 to 2,000 R.P.M.

- 7. 3 H.P. motor for table, saddle and knee.
- 8. Mechanical and electrical overload protection.
- 9. Interchangeable Assembly Unit Construction.
- 10. Removable coolant pan for easy clean-out,
- 11. Dial-type Horse Power load meter.
- 12. Spindle drive gear designed to reduce wear.

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.



GEORGE GORTON MACHINE CO.

1302 RACINE STREET

RACINE, WISCONSIN, U.S.A.

# GRINDING MACHINES, Carbide Tool

GRINDING MACHINES, Carbide Tool
American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass.
CarJoloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Standard Corp., 721 Springfield St., Dayton 1,
Ohio.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati, Ohio.
Triplax Machine 100 Corp., 75 West St., New
York 6, N.
Willey's Carbide Tool Co., 1340 W. Vernon
Hwy., Detroit 1, Mich.

# **GRINDING MACHINES, Centeriess**

Cincinnati Grinders, Inc., Cincinnati, Ohio. Heald Machine Co., 10 New Bond St., Worces-Heald Machine Co., 10 New Bond St., Warces-ter 6, Mass. Landis Tool Co., Waynesboro, Pa. Triplex Machine Tool Corp., 75 West St., New York 6, N. Y. Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking
Baird Machines Co., 1700 Stratford Ave.,

Stratford, Conn.
Stratford, Conn.
Stratford, Conn.
Stratford, Conn.
Strant Chucking Grinder Co., 257 Clinton St.,
Springfield, Vt.
Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Po.

GRINDING MACHINES, Crankshaft Landis Tool Co., Waynesboro, Pa. Norton Co., I New Bond St., Worcester 6, Mass.

# GRINDING MACHINES, Cylindrical

GKINDING MACHINES, Cylindrical
Arter Grinding Mch. Co., 15 Sogamore Rd.,
Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17,
N. York Corp., Mich.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6,
Mass. Mass. Action Co., 1 New Bond St., Worcester o, Mass. Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

Van Norman Co., 2640 Main St., Springfield 7, Mass.

# GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn. Landis Tool Co., Waynesboro, Pa.

# GRINDING MACHINES, Disc

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Clincinnati, Ohio.

# GRINDING MACHINES, Drill

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

# GRINDING MACHINES, Face

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Baird Machine Co., 1700 Stratford Ave., Stratford, Conn. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton 1, Ohio.
Mattison Machine Works, Rockford, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.

# GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

# GRINDING MACHINES, Gop

Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Waynesboro, Pa.

# GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

# **GRINDING MACHINES For Sharpening** Cutters, Reamers, Hobbs, Etc.

Barber-Colman Co., Rock and Montague, Rock-ford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Sidneyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich. Gleason Works, 1000 University Ave., Rochester 3, N. Ys., 1000 University Ave., Rochester Wis. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Landis Tool Co., Waynesboro, Pa. LeBland, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill. Pratt & Whitney, West Hartford 1, Conn. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.

# GRINDING MACHINES, For Sharpening Turning and Planing Tools

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. (Continued on page 342)





This 8%" SCHIESS model BF horizontal boring and milling machine... Now completely redesigned with many innovations. Here are a few...

Two individual drives—gear-drive for roughing, belt-drive for finishing. Belt-drive particularly suited to high-speed machining with carbide tools. New tool clamping device—does away with draw keys, hammers, drifts and binding screws. All spindle-slide movements controlled from easily accessible operating platform (or from pendant station or portable control panel, if desired). Special

main-drive belt requires no readjusting. Column, spindle-slide and boring spindle may be adjusted at rapid traverse.

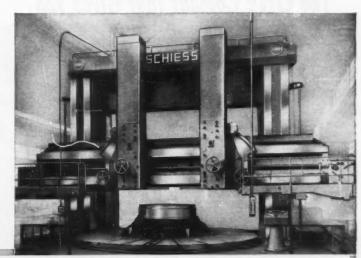
Spindle diameters, 6%" to 878". Maximum diameter bored, 59"—faced, 79".

It takes Europe's largest builder of heavy machine tools, Schiess, to turn out giants like these. Parts and service as close as Pittsburgh. And an American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all Schiess BF and K models.

# This 23 ft. SCHIESS model K vertical boring mill...

Look at all these new features—each one a time-saver! Rapid traverse motions with pushbutton control of changeover from feed motion to independent power traverse. Electro-mechanical locking of cross-rail to columns. Fingertip speed control—counterbalanced cross-rail and side-head—completely enclosed swiveling octagon rams—pendant control—automatic lubrication.

Turning diameters in standard sizes range from 8 ft. to 23 ft. (which can handle stock up to 100 tons!). Basic Schiess designs permit extra heavy machines, normally considered specials, to be built to your work diameter and load requirements. Even a diameter of 84 ft.!



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32, Mich.
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South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Clincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

# GRINDING MACHINES, Internal

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. nthal Div., Kaydon Eng. Corp., Muskegon, Mich.
Meald Machine Co., 10 New Bond St., Worcester 6, Mass.

Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass. Standard Electrical Tool Co., 2448-90 River Rd., Cincinnati, Ohio. Wicaco Mch. Corp., Wayne Junction, Philadel-phia, Pa.

# GRINDING MACHINES, Jig

Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn. Pratt & Whitney, West Hartford I, Conn.

# **GRINDING MACHINES, Knife and Shear**

Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

**GRINDING MACHINES, Piston Ring** 

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Helald Machine Co., 10 New Bond St., Worcester 6, Mass.
Martison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati 4, Ohio.

# GRINDING MACHINES, Profile

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Sheffield Corp., 721 Springfield St., Dayton 1. Ohio.

# GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa. Van Norman Co., Springfield, Mass.

# GRINDING MACHINES, Radial

Consolidated Mch. Tool Corp., Rochester, N. Y. Frauenthal Div., Kaydon Eng. Corp., Muskegon, Mich.
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton 1, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

# GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, Ill. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

# GRINDING MACHINES, Roll

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio. nati 9, Ohio.
Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6.
Mass.

# **GRINDING MACHINES, Spline Shaft**

Van Norman Co., Springfield, Mass.

# **GRINDING MACHINES, Surface**

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary) Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Wis.

Wis.

Blanchard Machine Co., 64 State St., Cambridge, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.

Frauenthal Div., Kaydon Eng. Corp., Muskegon, Mich.

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.

Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.

Hamilton Div. of the Ladge & Shipley Co., Hamilton I). Ohio.

Heald Machine Co., 10 New Bond St., Worcester 6, Mass.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Blanchard Machine Co., 64 State St., Cam-Ohia.

Mattison Machine Works, Rockford, III.

Norton Co., 1 New Bond St., Worcester 6, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Onio, Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio. Taft-Peirce Mfg. Co., Woonsocket, R. I. Thompson Grinder Co., 1500 W. Main St., Scripfield Obio. Springfield, Ohio. Walker, O. S. Co., Inc., Worcester, Mass.

# GRINDING MACHINES, Top

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. (Continued on page 344)

# Cutting or Grinding ALUMII



# Use INTERNATIONAL 131-A

# The ONE Coolant that Gives You All of These Advantages:

# 3 NO METAL DISCOLORATION

Does not stain aluminum or its alloys-regardless of concentration used.

# **INCREASES TOOL LIFE**

Prevents welding of chips to tool.

# **CUTS WHEEL DRESSINGS**

Retards loading of grinding dust on wheel.

# **DOES NOT REACT WITH ALUMINUM DUST**

No contamination-sanitary in every way.

# **NO SKIN IRRITATION**

Operators approve International 131-A.

# O SUPERIOR FINISH

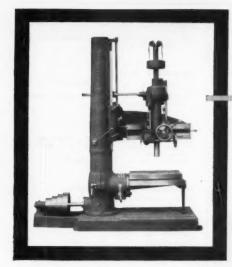
Profilometer readings of two micro-inches or less are readily obtained. Fewer rejects.

# International 131-A Gives Outstanding Results on Stainless Steel Too!

It will pay you to get the facts about International 131-A. Write for information.

# INTERNATIONAL CHEMICAL COMPANY

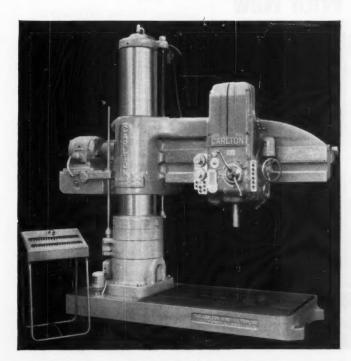
Specialists in Cleaners and Coolants for Industry 2628 N. Mascher Street . Philadelphia 33, Pa.



CARLTON	1916 Style D	1956 Model 4A
Speeds, number	4	36
Speeds, maximum, rpm	450	2000
Feeds, number	1	18
Main drive motor, hp	line shaft	25
Bearings, type	plain	anti-friction
Lubrication	manual	automatic
Spindle diameter at point of drive	15/16"	4"
Vertical travel of spindle	8"	20"
Traverse of head on arm	40"	59"
Traverse of arm on column	32"	44"
Shipping weight, lbs	3000	26,335

# Carlton RADIAL DRILLS

better than ever today...now available with pre-selector and programming device



For more information fill in page number on Inquiry Card, on page 245

The belt driven Style D Carlton radial drill (above)—an advanced design model when introduced in 1916—looks pretty old-fashioned today.

And indeed it is. For Carlton radial drills today are ever so much faster and more powerful. And thanks to two sensational developments, Carlton radial drills are now better than ever:

**Programming**—for pre-selecting speeds and feeds for an entire drilling program including as many as 20 or 30 operations.

**Pre-Selector**—for setting speed and feed for the next operation while machine is still under cut.

For a revealing radial drill demonstration, ask your Carlton distributor to arrange a showing of the new Carlton programming film. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

GRINDING MACHINES, Thread American Schiess Corp., 1232 Pen

GRINDING MACHINES, Threed
American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hirschmann Co., Carl, 30 Park Ave., Mannasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro,
Pa. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

GRINDING M. CHINES, Universal American Schie Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Frauenthal Div., Kaydon Eng. Corp., Muskegon,

Mich. Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6,

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.

# GRINDING WHEELS

Pratt & Whitney, West Hartford 1, Conn. Besty-Welles Corp. (Abrasive Div.), 20 N. Wacker Drive, Chicago 6, III. Blanchard Machine Co., 64 State St., Cam-

bridge, Mass. Carborundum Co., Buffalo Ave., Niagara Falls,

N. Y.
Cincinnati Milling Products Div., Cincinnati
Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ili.
Gardner Machine Co. (Surface Grinder), 414 E.
Gardner St. Beloit, Wis.
Macklin Co., 2925 Wildwood Ave., Jackson,
Mich.

Mich. Norton Co., 1 New Bond St., Worcester 6,

Mass.
Precision Diamond Tool Co., 102 South Grove
Ave., Elgin, III.
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

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Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Chambersburg Engrg. Co., Chambersburg, Pa. Erie Foundry Co., Erie, Pa.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa. Erie Foundry Co., Erie, Pa. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

# **HAMMERS**, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

# HAMMERS, Portable Electric

Millers Falls Co., Greenfield, Mass. Thor Power Tool Co., Aurora, lilinois

# HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

# HAMMERS, Shaft

Standard Pressed Steel Co., Jenkintown, Pa.

# HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa. Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Gleason Warks, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave.,
Cleveland, Ohio.

# HARDENING MACHINES, Flome

Cincinnati Milling Machine Co., Cincinnati, Ohio. Gleason Works, 1000 University Ave., Roches-ter, N. Y.

# HARDNESS TESTING INSTRUMENTS

Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa. Pa.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N.Y.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carll St., Jamaica, N., Van Wyck Ave., wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N.Y.

# HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

# HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rock-ford, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Twist Drill & Tool Co., Rochester,
Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.

# HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

(Continued on page 346)



# Use D&T Machines With New **Mechanical Power Heads**

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower mainte-nance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs.

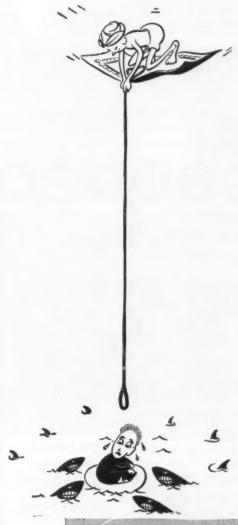
For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.

# Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.



Davis & Thompson Company 6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN



# ... for delivery when you need it

SEE YOUR



# DISTRIBUTOR

FOR THE FINEST IN

Hade by THEEADWELL Complete to

For more information fill in page number on Inquiry Card, on page 245

MACHINERY, February, 1956-345

# HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

# HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Thor Power Tool Co., Aurorg, Illinois

HOISTS, Chain, Etc. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

## HOISTS, Electric

Philadelphia Gear Works Inc., Erie Ave. and G St., Philadelphia, Pa. Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio

All ROCKFORD clutch plates not only are carefully checked for accuracy of dimensions, but are inspected on

an electronic balancing machine. Uniform operation, minimum wear,

# HONING MACHINES, External

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# HONING MACHINES, Internal (Cylinder)

(Cylinder)
Barnes Dill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Molline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sunnen Products Co., 7900 Manchester Ave.,
St. Louis 17, Mo.

### HONING STONES

Barnes Drill Co., 814 Chestnut St., Rockford,

Carborundum Co., Buffalo Ave, Niagara Falls, N. Y. Moline Tool Co. 102 20th St., Moline, III. Norton Co., 1 New Bond St., Worcester 6. Mass.

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Barnes Drill Co., 814 Chestnut, Ruckford, Ill. Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich. Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

# HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

## HYDRAULIC MACHINERY Tools and equipment

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Barnes, John S., Corp., Rockford, III. Bethlehem Steel Corp., Bethlehem, Pa. Birdsboro Steel Fdry. & Mch. Co., Birdsboro,

Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1,

Hydropress, Inc., 350 Fifth Ave., New York 1, NY, Lake Erie Engrg. Corp., Kenmore Station, Buffolo, N. Y.
Michigan Drill Head Co., Detroit 34, Mich. Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich. Gilgeor Co., 1569 W. Pierce St., Milwaukee, Wiss.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich. Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Vickers Incorporated, Div. of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich. Wilson. K. R., Inc., 211 Mill St., Arcade N. Y.

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Coutch must have accurate balance













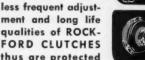


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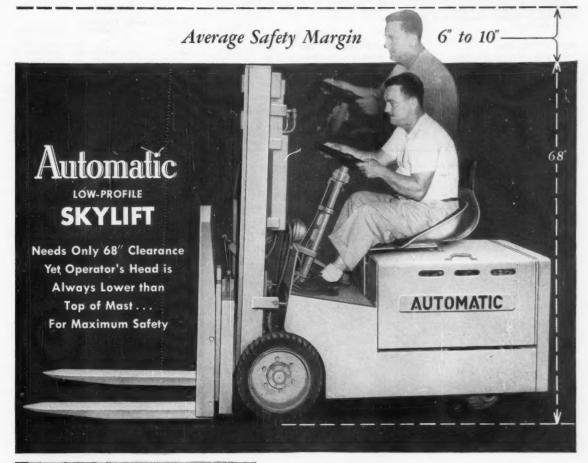
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(Continued on page 348)

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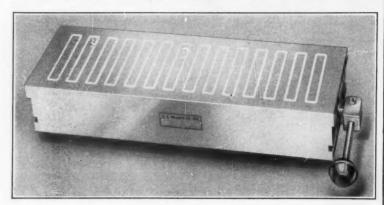
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LATHES, Automatic

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Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
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Sidney Machine Tool Corp., 75 West St., New
York 6, N. Y. (Continued on page 350)



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LATHES, Gap

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LATHES, Turret

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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

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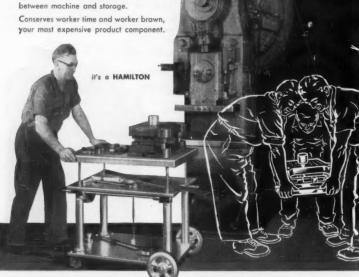
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(Continued on page 352)



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Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engr. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.

#### MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Mch. Works, Front St., and Girard Ave., Philodelphia, Pa.

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.

Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains N. Y. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mich. Tool Co., 2531 11th St., Rockford, III. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

#### MILLING MACHINES, Hand

MILLING MACHINES, Hand
Axelson Mfg. Co., 6 160 S. Boyle Ave., Los
Angeles 58, Cal.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd.,
Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield
7, Mass.

#### MILLING MACHINES, Horizontal, Plain **And Universal**

And Universal
American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Baldwin-Lime-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Brown & Sharpe Mtg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati,
Ohio. Brown & Sharpe Mrg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati, Ohlo. Consolidated Machine Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohlo. Ingersoll Milling Mch Co., 2442 Douglas St., Rockford, Ill. Kearney & Trecker Corp., Milweukee, Wis. Kempsmith Machine Co., Milwaukee, Wis. Pratt & Whitney, West Hartford 1, Conn. Sheldon Machine Co., Inc., 424-4258 N. Knox Ave., Chicago 41. Ill. Snyder Tool & Engra. Co., 3400 E. Lafavette Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill. Van Norman Co., 3640 Main St., Springfield 7, Mass.

#### MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence R. I. Sunstrand Mch.. Tool Co., 2531 11th St., Rockford, III.

#### MILLING MACHINES, Planer Type

MILLING MACHINES, Planer Type
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard
Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn.
R. R., Evanston, Cinclnnati, Ohio.
Ingersol Milling Mch. Co. 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

#### MILLING MACHINES, Profile

MILLING MACHINES, Profile

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.

Cincinnati Milling Machine Co., Cincinnati, Ohio.

Cosa Corp., 405 Lexington Ave., New York 17.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Frew Machine Co., 121 East Luray St., Philadelphia 29, Pa.

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

Pratt & Whitney, West Haitford 1, Conn.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

#### MILLING MACHINES, Ram Type Universal

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Van Norman Co., 3640 Main St., Springfield 7, Mass.

#### MILLING MACHINES, Turret Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Col. Bridgeport Machine, Inc., Linley Ave., Bridge-port, Conn.

#### MILLING MACHINES, Vertical

MILLING MACHINES, Vertical

American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.

Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.

Boldwin-Lime-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.

Consolidated Machine Tool Corp., Rochester,
N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave.,
Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoil Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.

(Continued on page 354)



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#### MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools

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Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Cincinnati Milling Mch. Co., Oakley, Cincin-nati 9, Ohio. Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Pratt & Whitney, West Hartford 1, Conn. Turchan Follower Machine Co., 8259 Livernols & Alaska Aves., Detroit, Mich.

#### MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Erie Foundry Co., Erie, Pa. Hannifin Corp., 501 S. Wolf Rd., Des Plaines,

III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rickford, III.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.

#### MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio. General Electric Co., Schenectady, N. Y. Howell Electric Motors Co., Howell, Mich. Reliance Electric & Engra. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

#### MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

#### MULTIPLE-SLIDE FORMING MACHINES

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#### NIBBLING MACHINES

Wales-Strippet Corp., North Tonawanda, N. Y.

#### NICKEL, Alloys

International Nickel Co., 67 Wall St., New York, N. Y.

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Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

#### NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

#### NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

#### **NUT TAPPERS**

See Bolt and Nut Machinery,

#### NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, III. Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York,

NUTS, Thumb or Wing and Cap

Williams, J. H., & Co., 400 Vulcan St., Buffalo

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De Laval Separator Co., Poughkeepsie, N. Y.

#### OIL GROOVERS

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Chicago Rowhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Crane Packing Co., 1800 Cuyler Ave., Chicago. III. Garlock Packing Co., Palmyra, N. Y.

#### OILERS AND LUBRICATORS

Madison-Kipp Corp., Madison, Wis.

#### OILS, Cutting

See Cutting and Grinding Fluids.

#### OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave.,
Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New
York. Yark.
Socony Mobil Co., Inc., 26 Broadway, New
York, N. Y.
Standard Oil Co., (Indiana), 910 5. Michigan,
Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St.,
Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

#### OILS, Quenching and Tempering

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Houghton & Co., E. F., 303 W. Lehigh Ave.,
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Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan
Chicago, III.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St.,
Chicago 23, III.

#### OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

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ORDNANCE MACHINES, Special

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Milholland, W. K., Machinery Co., 6402 Westfield Bivd., Indianapolis 5, Ind.,
Renhaberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, Ill.

Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

#### PACKING, Leather, Metal, Rubber,

Asbestos, Etc.
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Crane Packing Co., 1800 Cuyler Ave., Chicago,
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave.,
Philadelphia, Pa.

#### PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Starrett, The L. S., Co., Athol, Mass. (Continued on page 356)



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Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Norma-Hoffman Bearings Corp., Stamford, Conn. Standard Pressed Steel Co., Jenkintown, Pa.

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American Brass Co., 25 Broadway, New York, N. Y. American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### PIPE. Steel

PIPE, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt, & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
United States Steel Corp., National Tube Co.,
Div., 436 7th Ave., Pittsburgh, Pa.

#### PIPE THREADING AND CUTTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

#### PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

#### PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn
R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, III.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.

#### PLANERS, Double Housing and Openside

PLANERS, Double Housing and Openside
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton,
Div., Hamilton, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave, N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate,
Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Cray, C. A. Co., Woodburn Ave., and Penn
R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, III.

#### PLATE ROLLS

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch., Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.

#### PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

#### **PLATES**, Surface

Brown & Sharpe Mfg. Co., Providence, R. I. Challenge Machinery Co., Grand Haven, Mich.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854
E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

#### PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ohio. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, 

#### POLISHING LATHES AND MACHINES

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Millers Falls Co., Greenfield, Mass. Standard Electrical Tool Co., 2455 90 River Rd., Cincinnati, Ohio. Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

#### POLISHING TOOLS, Portable

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill. Thor Power Tool Co., Aurora, Illinois

#### POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

#### PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philodelphia 42, Pa. Dake Corp., 604 Seventh St., Grand Haven, Mich. duMont Corp., Greenfield, Mass. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. III.
Logansport Machine Co., Inc., 810 Center
Ave, Logansport, Ind.
Threadwell Top & Die Co., Greenfield, Mass.
Tomkins-Johnson Co., 614 No. Mechanic St.,
Jackson, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

#### PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven, Ferracute Machine Co., Bridgeton, N. J. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. Lake Erie Engrg. Co., Kenmore Station, But-falo, N. Y. Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.

#### PRESSES, Extrusion

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.

Chambersburg Engrg, Co., Chambersburg, Pa. Frie Foundry Co., Erie, Pa. Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydrogress, Inc., 350 Fifth Ave., New York, N. Y. Lake Erie Engrg. Co., Kenmore Station, Butfalo, N. Y. Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

#### PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis. Ferracute Machine Co., Bridgeton, N. J. Niagara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y.

#### PRESSES, Forging

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(Continued on page 358)

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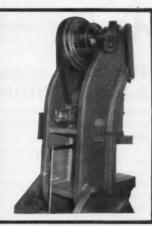
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Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Dake Corp., 604 Seventh St., Grand Haven,

Dake Copp.,
Mich., New York J., N., Mich., M

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Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
National Mchy. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niogara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Hydraulic

American Brooch & Mch. Co., Ann Arbor, Mich.

American Brooch & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros., Mfg. Co., 1910 Kishwaukee St., Rockford, Ill., Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42. Pa. Berhlehem, Pa. Birdsboro Steel Fdry. &Mch. Co., Birdsboro, Pa. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa. Cincinnati Milling Mch. Co., Oakley, Cincincinnati Milling Mch. Co., (Hydroform), Cincinnati Milling Mch. Co., (Hydroform), Cincinnati Milling Mch. Co., Is., Industries, Inc., 6489 Mch. Corp., Div. U. S. Industries, Inc., 6499 Mch. Corp., Div. U. S. Industries, Inc., 6499 Mch. Corp., Div. U. S. Industries, Inc., 6499 Mch. Corp., Philop. Div. U. S. Industries, Inc., 6499 Mch. Corp., 604 Seventh St., Grand Haven, Mich. Phys., Ch. Columbus.

Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.

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NY Cropress, Inc., 330 Fifth Ave., New York 1, N. Y. Lake Erie Engrg. Corp., Kenmore Station, Butfalo, N. Y. Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Niogara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Verson Allsteel Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton. Ohio. Dake Corp., 604 Seventh St., Grand Haven Dake Corp.,
Mich.
Mich.
Ferrocute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

PRESSES, Sheet Metal Working
Allen, Alva F., Box 426, Clinton, Mo. (Bench,
American Steel Foundries, Elmes Engrg. Dlv.,
Poddock Rd. and Tennessee Ave., Cincinnati, Ohio-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch Co. (Hydroform), Cincinnati 4, Ohio.
Cincinnati Shaper Co., Elam and Garrara
Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Dlv. U. S. Industries, Inc.,
6499 W. 65th St., Chicago, Ill.

Cleveland Crane & Engrg. Co., Wickliffe, Ohio. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Doke Corp., 604 Seventh St., Grand Haven, Dake Corp., 604 Seventh St., Grand Haven,
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, IIII.
Dreis & Krump Mfg. Co., 7416 Loomis Bivd.,
Chicago 50, Wis. Co., 7416 Loomis Bivd.,
Chicago 50, Wis. Co., 7416 Loomis Bivd.,
Chicago 50, Wis. Co., 7416 Loomis Bivd.,
Chicago 50, Wis.
Espen-Lucos Machine Works, Front St., and
Girard Aves., Philidalphia, Pa.,
Famco Machine Co., 3134 Sheridon Rd.,
Kenosha, Wis.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Lake Erie Engra. Corp., Kenmore Station. Buf-Lake Erie Engrg. Corp., Kenmore Station, Buf-falo, N. Y. Lake Erie Engra. Corp., Kenmore Station, Burfalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Verson Altsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Straightening

PRESSES, Straightening
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Clincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St.,
Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P. O. Box 37.
Harper 5ta., Detroit 13, Mich.
Corsolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven.
Mich.
Erie Foundry Co., Erie, Pa.
Hamilfin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y.
Niagara Machine & Tool Works (Hydraulic),
683 Northland Ave., Buffalo, N. Y.
Philips & Davies, Inc., 920 Steiner Ave.,
Kenton, Ohio
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

#### PROFILING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Col. 6160 S. Boyle Ave., Los Cincinnati Milling Mch. Co., Oakley, Cincin-nati 9, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. EN. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32. Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20. Pa.
Gorton, George Machine Co., 1110 W. 13th
St., Racine, Wis.
Fratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

#### **PULLEYS, Friction Clutch**

Brown & Sharpe Mfg. Co., Providence, R. I.

#### PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I. Gray-Mills Co., 1948-52 Ridge Ave., Evanston, III. III.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave.,
Logansport, Ind.
Ruthman Machinery Co., 1809 Reading Rd.,
Cincinnati 12, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend. Ind.
Tomkins-Johnson Co., Jackson, Mich.
Vickers Incorporated, Division of Sperry Rand
Corp., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

#### PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Boldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Barnes, John S., Corp., Rockford, III.

(Continued on page 360)

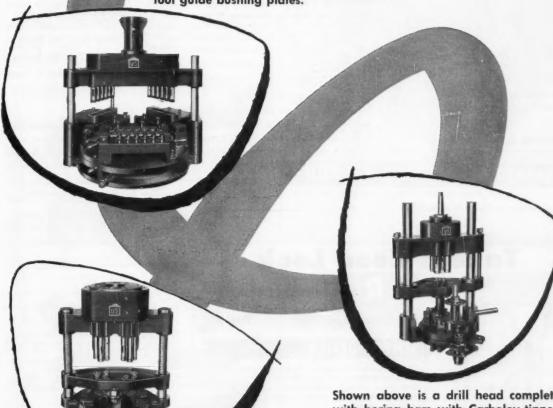


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Lapointe Machine Tool Co., 34 Tower St.,
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Sundstrand Machine

Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

Rockford, III.

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Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Engineering & Research Corp., Riverdale, Md.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III.

Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y. Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, III. Verson Alisteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, III. Wales-Strippet Corp., North Tonawanda, N. Y. Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

#### RACKS, Gear Cut

RACKS, Gear Cut
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Brown & Sharp Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, CleveIrnd, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and
G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave.,
Cleveland 14, Ohio.

#### REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, 111.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

#### REAMERS

Ace Drill Corp., Adrian, Michigan.
The Afrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Barber-Colman Co., Rock and Montague, Rockford, III.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis Barber-Colman Co., Rock and Montague, Rockford, III.

Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.

Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohlo.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.,
Frendeld Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide &
Carbon Corp., 30 E. 42nd St., New York,
N. Y.
Lipe-Rollaway Corp., 806 Emerson Ave., Syro-Lipe-Rollaway Corp., 806 Emerson Ave., Syra-Lipe-Rollaway Corp., 800 emerson Ave., 97. cuse, N. Y.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., & Winter
Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1 Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicage 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Super Tool Co., 2 Noonsocket R. I.
Mich.
Taft-Peirce Mfg. Co., Woonsocket R. I.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1 Mich.

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Barber-Colman Co., Rock and Montague, Rock-ford, III. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besty-Welles Cotp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co. Box 237, Roosevelt Park Annex, Detroit 32, Mich. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St. Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass. McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney West Hartford 1, Conn. Taft-Peirce Mig. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd. Plymouth, Mich.

#### REAMERS, Taper Pin

The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, ton 11, Conn.
Besiy-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N.;
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn
Whitman & Barnes, 40600 Plymouth, Rd.,
Plymouth, Mich.

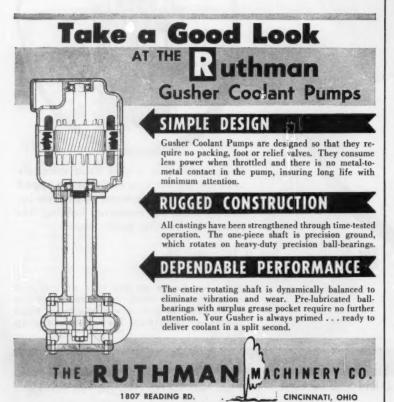
#### REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Bill.
Buhr Mch. Tool Co., 835 Green St., Affil Color.
Mich.
Greaves Machine Tool Co., 2009 Eastern
Avenue, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kaufman Manufacturing Co., Manitowac, Wis.
Michigan Drill Head Co., Detroit 34, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7,
Mass.

#### RECORDING INSTRUMENTS

National Acme Co. (for counting), 170 E. 131st St., Cleveland, Ohio.

REELS, Stock, Standard and Automatic U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. (Continued on page 362)

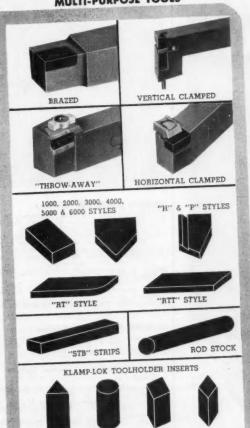


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Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

RIVETERS, Pneumatic

Chicago Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St.,
Bridgeport S, Conn.
Ingersoil-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Thor Power Tool Co., Aurora, Illinois
Wood & Co., R. D. Public Ledger Bldg.,
Philadelphia, Pa.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N. Y. Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Tomkins-Johnson Co., Jackson, Mich.

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RUBBER PRODUCTS

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Brown & Sharpe Mfg. Co., Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S. Co., Athol, Mass.

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SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

SANDERS

SANDERS
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Ingersoll-Rand Co., Phillipsburg, N. J.,
Matrison Machine Works, Rockford, III.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, III.
Thor Power Tool Co., Aurora, Illinois

SAW BLADES, Hack

Armstrong-Blum Mfg, Co., 5700 W. Blooming-dale Ave., Chicago, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works., Front St. and Girard Ave., Philodelphia, Pa. Motch & Merryweather Mchry Co., Penton Bldg., Cleveland, Ohio. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

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Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Lourel Ave., Des Plaines, III.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton
Bldg., Cleveland. Ohio.
H. P. Townsend Mfg. Co., Elmwood, Conn.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.
Wallace Tube Co., (Abrasive) 1304-08 Diversy
Pkwy., Chicago 14, III.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, III Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

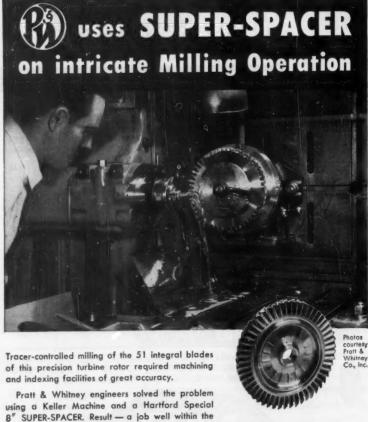
SAWING MACHINES, Metal Cutting

Bend
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hock

American Schiess Corp., 1232 Penn Ave.,
Pittsburgh 22, Pa.
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, III.
Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.

(Continued on page 364)

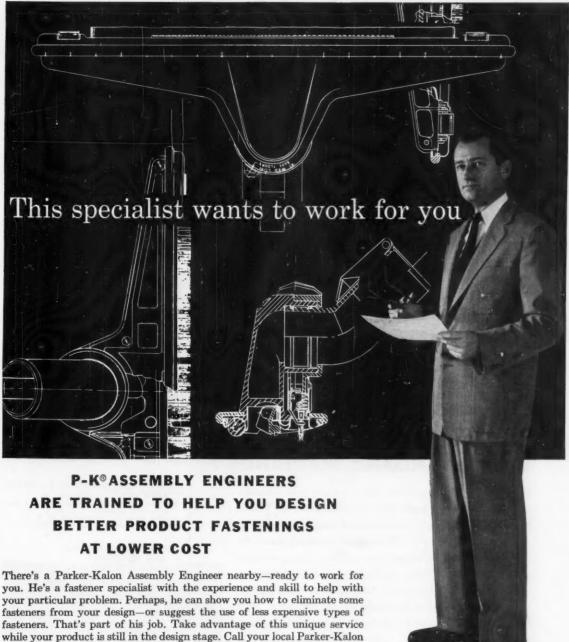


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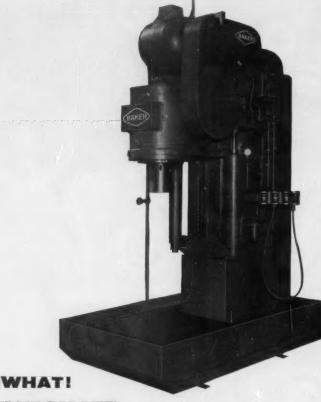


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DoAli Co., 254 Laurel Ave., Des Plainee, Ill.
Espen-Lucos Machine Works, Front St. and
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Motch & Merryweather Mchry Co., Penton
Bidg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter
Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Pitchburg, Mass.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

#### SAWS, Metal Cutting Band

Armstrong-Blum Mfg, Co., 5700 W. Blooming-dale Ave., Chicago, III.
DoAli Co., 254 Laurel Ave., Des Plaines, III.
Johnson Mfg. Co., Albion, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass. Starrett, The L. S., Co., Athol, Mass.

#### SAWS, Portable Electric

Millers Falls Co., Greenfield, Mass. Thor Power Tool Co., Aurora, Illinois

#### SAWS, Screw Slotting

SAWS, Screw Slotting
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence S. R. I.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

#### SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.

#### SCREW DRIVERS, Power

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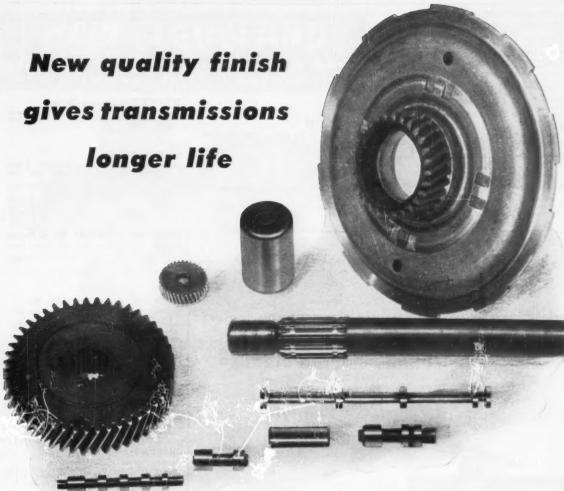
AND EQUIPMENT

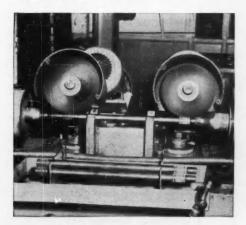
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Clincinnati 12, Ohio.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholf Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Otter & Johnson Co., 1027 Newport Ave., Powtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P.O. Box 350.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

#### SCREW MACHINE WORK

...

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Estern Mch. Screw Corp., New Haven, Conn. Mueller Brass Co., Port Huron 35, Mich. National Acme Co., 170 E. 131st St., Cleveland, Ohio. Ottemiller, M. H., Co., York, Pa. Standard Pressed Steel Co., Jenkintown, Pa. Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa. (Continued on page 366)





FINE particles of steel, especially burrs, entering complex automatic transmissions cause excessive wear, possible failure.

Automatic, production-line brush finishing equipment, as found in major automotive plants, removes all burrs from precision-fitting transmission parts. In addition, it produces microinch surface finishes never before achieved . . . to increase transmission life.

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New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Warner & Swosey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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See also Lathes, Turret perican Schiess Corp., 1: 1232 Penn Ave., American Schiess Co Pittsburgh 22, Pa.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio.

land 13, Ohio.

Srown & Sharpe Mfg. Co., Providence, R. I.

Gisholt Machine Co., 1245 E. Washington Ave.,
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Hardinge Bros., Inc., 1418 College Ave.,
Elmira, N. Y.

Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.

Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

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Chicago Screw Co., Bellwood, III.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100
Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping, Drive

Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York, N. Y.

#### SCREWS, Thumb

Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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De Laval Separator Co., Poughkeepsie, N. Y.

#### SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, III. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

#### SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa. Cumberland Steel Co., Cumberland, Md. De Laval Separator Co., Poughkeepsie, N. Y. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, 111.

#### SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

#### SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

#### SHAFTS, Turned and Ground

Bethlehem, Pa.

Steel Co., Cumberland, Md.

National Forge & Ordnance Co., Irvine, Warren
County, Po.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,

Chicago 18, III.

#### SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

#### SHAPERS

SHAPERS

American Schiess Corp., 1232 Penn Ave.,
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American Tool Works Co., Pearl and Eggleston
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Atlas Press Co., Kalamazoo, Mich.
Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
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Cincinnati Shaper Co., Elam and Garrard Aves.,
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(Continued on page 368)



longitudinal table travel and cross feed are hydraulically actuated.

Wheel head has powered rapid vertical travel. Table speed is variable up to 125 fpm . . . faster than

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That's why so many tool room men insist on Grand Rapids Grinders.

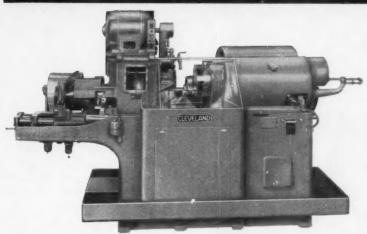
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Grand Rapida No. 55 Hydraulic Feed Surface Grinder Table speed up to 125 fem. Working surface table is 12" x 36". Vertical movement of whe head 18". Preloaded ball bearing spindle greas for IIIe. Spindle speeds 1925 and 2500 rpi

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More than 65 years of automatic screw machine design experience has been engineered into this new Model "AW" Cleveland. Its many modern features will enable your shop to set new economy records for fast, accurate production of turned and formed parts . . . and you save three ways:

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Your savings start at the first cost, as the 2½" Model "AW" is offered at a base price of \$3500 to \$4000 less than other comparable automatics!

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Such features as universal camming . . . rapid hand crank stock feed adjustment . . . quick change collet pads . . . maximum accessibility for tooling . . . make this Cleveland quick to set-up and exceptionally economical to operate. Spindle speeds range from 69 to 1920 rpm, providing efficient cutting speeds for all types of materials and tools. Four full automatic speed changes are available. Gear changes are quickly made.

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Simplicity is the keynote of this Cleveland design. Completely free from complex mechanism and controls requiring constant attention or adjustments, this rugged, fool-proof automatic will assure the user dependable day-in, day-out performance!

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Remember: Clevelands Cut Costs-

THE CLEVELAND AUTOMATIC MACHINE COMPANY

Several examples of typical Model "AW" production are shown here. Note the profitable production rates—the variety of operations performed with simple tooling.

Material: 24ST Aluminum Operations: Drill (2); C'bore; Ream; Face; Form (2); Cut-off. Production: 62 pieces/hr.

Material: SAE 2317 Operations: Drill (2); C'bore; Tap; Face; Form (2); Cut-off. Production: 41 pieces/hr.

Material: FM Brass Operations: Drill (2); Thread; Bore; Form; Knurl; Cut-off. Production: 110 pieces/hr.

Material: SAE 4615 Operations: Turn; Form (2); Thread; Center; Face; Chamfer; Cut-off. Production: 36 pieces/hr.

Material: 24ST Aluminum
Operations: Drill (2); C'bore;
Chamfer; Face (2); Form (2);
Cut-off. Production:
80 pieces/hr.



Write for this new bulletin for full details on the 2½" Model "AW" Cleveland

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SALES OFFICES: CHICAGO CLEVELAND • DETROIT HARTFORD • S. ORANGE Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III. Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, III. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

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Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

#### SHAPERS, Structural

Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp., Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

#### SHEARING MACHINERY

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Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III.

Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

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Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland,
Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.

Cleveland Punch & Shear Works Co., 3917 St.

Cloir Ave., N. E. Cleveland, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Niagara Mch. & Tool Works, 683 Northland

Ave., Buffalo, N. Y.

Hydropress, Inc., 350 Fifth Ave., New York 1,

N. Y.

N. Y. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.

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SHEARS, Squering
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Cleveland Punch & Shear Works Co., 3917 St.
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Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton Div. of the Lodge & Shipley Co.,
Homilton J., Ohio.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Simonds, Saw & Steel Co. (Blades), 470 Main
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Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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American Brass Co., 25 Broadway, New York. N. Y.

Bethiehem Steel Co., Bethlehem, Pa.

New Jersey Zinc Co., 160 Front St., New York,
N. Y.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.

J. S. Steel Corp., (Carnegie-Illinois Steel Corp.,
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Coal, Iron & R. R. Co., Div.), 436 7th Ave.,
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U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

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Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester,
Mich. Mich.

Mich.

Mich.

Prott & Whitney, West Hortford I, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago

8, III.

Shenango-Penn Mold Co., Dover, Ohio

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Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio. Consolidated Meh. Tool Corp., Rochester, N. Y. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del. Rockford Meh. Tool Co., 2500 Kishwaukee St., Rockford, III.

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#### SPECIFICATIONS

Capacity-10' rounds, 18' flats Motor-1/2 H. P. Ball Bearing any voltage available, single or poly-phase (1/4 H. P., on wet machine) Wheel Diameters-16' Floor Space—66" x 31"
Bed—11' wide, 44" long, 6" deep, 24" high

Overall Height (Closed)-39" Blade Length—11'5'x %" x 032" All Standard blades of thes specifications can be used.

Weight-Approximately 750 lbs. Crated 800 lbs. Boxed for export 875 lbs.

Speeds-35, 90, 130, 190 feet per minute Casters - Optional at slight extra

## OTHER MODELS AVAILABLE

quick, simple set up plus entirely auto-

matic operation. Beautifully designed

and engineered, yet a brute for work, the versatile Model J is immediately available in the standard wet or dry

The big, dependable Model J will cut

anything in your stock pile-faster and

more accurately. See for yourself, how

much time, labor and production dollars you can save with a Johnson saw.

models to suit your needs.

Other nationally popular members of the Johnson line of metal cutting Band Saws include the 5° x 10° capacity Model "B" (wet or dry), the unique versatile mobile Model "M" and the Johnson Adjustable Stock Stand.

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Greenfield Tap & Die Corp., Greenfield, Mass.

National Twist Drill & Tool Co., Rochester.

Mich.

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Scully-Jones & Co., 1903 Rockwell St., Chicago

8, III.

Williams, J. H. & Co., 400 Vulcan St., Buffalo

7, N. Y.

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.

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Baird Machine Co., 1700 Stratford Ave., Stratford, Com.
Baidwin-Lima-Hamilton Corp., Eddystone Div., Philodelphia 42, Pg.
Baidwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.
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Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philodelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
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Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Moss.
Bliss, E. W. Co., 1375 Raff Rd., S. Vr., Curron,
Ohio.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
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A Ohio.

Suhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

Chambersburg Engra. Co., Chambersburg, Pa. Cincinnati Milling Mch. Co., Oakley, Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.

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Consolidated Mch. Tool Corp., Rochester, N. C. Couler, James, Machine Co., Bridgeport 5, Corn.

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St., Hartford, Corn. Hil. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.
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Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York,
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Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. H.
Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. H.
Michigan Corp., Milwaukee, Wis.
Michigan Tool Co., 7171 E. McNichols Rd., Mich. Michigan Tool Co., 7171 E. McNichols Rd., Michigan Tool Co., 7171 E. McNichols Rd., Milholland, W. K. Machinery Co., 6402 West-field Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., 5 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niogara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philips and Davies. Inc., 920 Steiner Ave.

Oligear Co., 1509 W. Pierce St., Millwaukee, Wis.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lofayette, Detroit 7, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854
E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Townsend, H. P. Mfg. Co., Einwind, Conn. Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich. Universal Engrg. Co., Frankenmuth 2, Mich. Verson Alisteel Press Co., 93rd 5t. & S. Kenwood Ave., Chicago, III. Waltham Machine Works, Newton St., Waltham Mass. wood Ave., Chicago, III.
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Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.
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Modern, heavy cast-iron pedestal (included in base price of lathe) completely encloses motor and drive . . . with storage space in tailstock leg for tools and chucks.

Contraction of the second tallstock action (b) 111

mp permits rapid re-se and instant lock-of tailstock

Run this new Sebastian lathe. Test its performance. You will appreciate the powerful cuts that this lathe can take. Write for circulars on 13" and 15" Sebastian lathes and name of nearest dealer where you can see and operate these outstanding lathes.

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In one way we're a little like the old-timer who religiously took a bath every Saturdaywhether he 'needed it or not.' We take somewhat the same attitude towards the replacement of our gear manufacturing equipment. We purchase new equipment and tools and retire old machines on a regular calendar basis, even though the old ones may seem adequate for further use. It is all too easy to slip into the habit of putting off purchase of a new unit because the old one still has "lots of use left in it," or is still "relatively" efficient. By prodding ourselves into the purchase of new equipment on a 'schedule' we have avoided this pitfall, and today we have as modern and efficient gear manufacturing facilities as any in the industry. Even our factory buildings (have you ever seen our plant?) reflect this constant striving for the better and the more efficient-for our present plant, built in 1942, replaced a plant that then was a relatively modern installation.

Just as the fellow who took the Saturday night bath was not out of step with the world 50 or 75 years ago, neither was the firm who bought their production machinery "to last." Today, however, the march of technological progress has become so fast and so relentless that we cannot afford to be content with what we have; an aggressive modernization policy is a must. We've built up a reputation for producing the best in custom gears, and for producing them efficiently-and we intend to keep that reputation in years to come.

#### THE CINCINNATI GEAR CO. CINCINNATI 27, OHIO

"Gears - Good Gears Only"



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Twin Disc Clutch Co., 1361 Racine St., Racine,
Wis. Farrel-Birmingham Co., Inc., 25 Main St., An-

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Pope Mchry, Corp., Haverhill, Mass. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

SPINDLES, Grinding

Sex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Pope Mchry, Corp., Haverhill, Mass. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### SPINNING LATHES

See Chucking Machines.

#### SPROCKET CHAINS

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SPROCRETS

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Stahl Gear & Mch. Co., 3901 Hamilton Ave.,
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Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bidg.,
Pit burgh 30, Pa.
Firth Derling Inc., 3113 Forbes St., Pittsburgh
30, Pa. Pit burgh 30, Pa.
Firth Iterling Inc., 3113 Forbes St., Pittsburgh.
30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div., 1436 Ave., Pittsburgh, Pa. Wheeler-Lovejay & Co., Inc., Cambridge, Mass.

#### STEEL, Cold Drawn

STEEL, Cold Drawn

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American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.),
Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, High Speed Tool

STEEL, High Speed Tool
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Armstrong Bros. Tool Co., 5200 Armstrong
Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bidg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.

Simonds Saw & Steel Co., 470 Main St., Fitchburgh, Mass. Vanadium Alloys Steel Co., Latrobe, Pa. Wheelock-Lovejoy & Co., Inc., Cambridge. Mass.

#### STEEL, Machine

STEEL, Machine
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

#### STEEL, Stainless

STEEL, Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div.), 436
7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

#### STEEL, Strip and Sheet

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron
& R. R. Co. Div.), 436 7th Ave., Pittsburgh,
Pa.

#### STEEL, Tool and Die

STELL, Tool and Die
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys teel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

#### STEEL ALLOYS

See Alloys, Steel

#### STEEL BARS

See Bars, Steel

#### STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I. Starrett, The L. S., Co., Athol, Mass.

#### STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

#### STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

#### STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., 1 New Bond St., Warcester 6, Mass.

#### STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

#### STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire Lewis Machine Co., 3441 E. 76th St., Cleve-land 27, Ohio Sesco, Inc., 8881 Central, Detroit 4, Mich. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

#### STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P.O. Box 37, Harper 5ta, Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave.,
Kenton, Ohio
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Altsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

#### STUD SETTERS

Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

#### SUB-PRESSES

Waltham Machine Works, Newton St., Wal-tham, Mass.

#### SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

#### SURFACE CHECKING EQUIPMENT

Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

#### SURFACE PLATES

See Plates, Surface

#### SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.

#### SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis. General Electric Co., Schenectady, N. Y. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

#### TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

#### TANGS, Replaceable, Drill & Reamer

Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

#### TAPER PINS, Standard

Chicago Screw Co., Bellwood, III. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Pratt & Whitney, West Hartford 1, Conn.

#### TAP HOLDERS

Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardeno, Calif. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y. McCrosky Tool Co., 1938 Thomas St., Mead-ville Pa. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

#### TAPPING ATTACHMENTS AND DEVICES

AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.

Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.

Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.

Errington Mechanical Laboratory, Inc., 24

Norwood Ave., Stapleton, S. I., N. Y.,

Etca Tool Co., Inc., 592 Johnson Ave., BrookIyn, N. Y.,
Leland-Gifford Co., 1425 Southbridge St.,
Worcester, Mass.

Michigan Drill Head Co., Detroit 34, Mich.

Morris Machine Tool Co., Inc., 946-M Harriet

Schingins Co., 435 Eastern Ave., Bellwood, III.

Thriftmaster Products Corp., 1076 N. Plum St.,
Lancaster, Pa.

#### TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 70, Ohio. Barnes Drill Co., 814 Chestnut, Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Rockford, III.
Baush Machine Tool Co., 156 Wasson Ave.,
Springfield 7, Mass.
Badine Corp., 317 Mt. Grove St., Bridgeport,
Coop. Conn.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y. N. Y. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich. Hoof Ca., as deen st., July Abd., Mich. Challenge Mchry Co., Grand Haven, Mich. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Frew Machine Co., 121 East Luray St., Philadelphia, 20, Pa. Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill. Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

(Continued on page 372)





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National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Notional Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill. Townsend, H. P. Mfg. Co., Elmwood, Conn. Warner & Swasey Co., 5701 Carnegle Ave., Cleveland 3, Ohio.

#### TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Unio.

Michigan Drill Head Co., Detroit 34, Mich.

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Geometric Tool Co., Westville Station, New Haven 15, Cons.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Po.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Cons.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

#### TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Sheffield Corp., 721 Springfield St., Dayton 1. Ohio.

#### TESTING EQUIPMENT, Tension,

Compression, Fatigue, etc.

Olsen Tinius Testing Mch. Co., Willow Grove.
Pa.

#### THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I. Cosa Corp., 405 Lexington Ave., New York 17.
N. Y. N. Y.
Coulter, James, Machine Co., Bridgeport 5,
Conn.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Esstern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio. Hill Acme Co., 1201 W. 651n St., Cleveland S., Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Londis Mch. Co., Waynesboro, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Prott & Whitney, West Hartford 1, Conn.
Rivett Lothe & Grinder, Inc., Brighton, Boston
35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N., Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Taft-Peirce Mfg. Co., Woonsacket, R. I.

#### THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, III. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Eastern Mch. Screw Corp., New Haven, Conn. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn., Rivett Lathe & Grinder, Inc., Brighton, Baston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Officer Mfg. Co., Waonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffale 7, N. V.

#### THREAD GAGES

See Gages, Thread

#### THREAD GRINDING MACHINES

See Grinding Machines, Thread

#### THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn. Lees-Bradner Co., Cleveland, Ohio. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield St., Dayton 1, Waltham Machine Works, Newton St., Wal-tham, Mass.

#### THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

#### THREAD ROLLING MACHINES

Landis Machine Co., Waynesbore, Pa. Hartford Special Mchry. Co., 287 Hemestead St., Hartford, Conn. Reed Rolled Thread Die Co., P.O. Bex 350, Worcester I, Mass.

#### TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R.R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

#### TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Sorp., Pittsburgh, Pa. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. sesty-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago I8, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelck-Lovejoy & Co., Inc., Cambridge, Mass.
Wasson & Barnes, 40600 Plymouth Rd., Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

#### **TOOL BITS, Special Alloy**

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Kennametal, Inc., Latrobe, Pa., Vanadium Alloys Steel Co., Latrobe, Pa. Wesson Co., 1200 Woodward Heights Blvd., Ferndale, Mich.

#### TOOL CONTROLS

Royal Design & Manufacturing, Inc., 4133 E. Ten Mile Rd., Centerline, Mich.

#### TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and planing Tools

#### TOOL HOLDERS

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardeno, Calif.

Davis Boring Tool Div., Giddings & Lewis Mochine Tool Co., Fond du Lac, Wis.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

Detroit, Mich.

Ave., Akron 11, Ohlo.

R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret) South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. Wasson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. V.

#### TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### TOOL STEEL

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Ryerson, Jos. T., & Son, Inc., 2558 16th St., Chicago 18, Ill. Vanadium Alloys Steel Co., Latrobe, Pa.

#### TOOLS, Carbide-Tipped

Ace Drill Corp., Adrian, Michigan.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
The Afrax Co., (Corbide) 240 Day St., Newing-ton 11, Corn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Corp., Dear General Electric Co. Wis.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Kennametal, Inc., Latrobe, Pa. 30, Pa. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. National Twist Drill & Tool Co., Roch Rochester, Mich Newcomer Products, Latrobe, Pa. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndole, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

#### TOOLS, Lathe, Shaper and Planer

TOOLS, Lettle, Snaper and France Allegheny Ludium Steel Corp., Pittsburgh, Pa. Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Bullard Co., Brewster St., Bridgeport 2, Conn., Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Mich.
du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pc.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Lathrobe, Pa.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit
13, Mich. 

#### TRANSFER MACHINES, Automotic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn. Barnes Drill Co., 814 Chestnut St., Rockford, Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Buhr Mch. Tool Co., 533 citem st., Colonial Broach & Machine Co., P.O. Box 37, Harper Sta, Detroit 13, Mich. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Drill Head Co., Detroit 34, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

#### TRANSFORMERS

General Electric Co., Schenectody, N. Y.

#### TRANSMISSION, Variable Speed

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. vis. Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

#### TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridge-port 5, Conn.

#### TUBE FORMING AND WELDING MACHINES

Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Yoder Co., 550 Walworth Ave., Cleveland,

#### TUBE MILLS

Abbey-Etna Co., 2444 Maplewood Ave., Toledo 10, Ohio. Yoder Co., 550 Walworth Ave., Cleveland,

#### TUBE TESTING AND EXPANDING MACHINE

Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

#### TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y. Mueller Brass Co., Port Huron 34, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa.

National Tube Div., U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa. Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill. Timken Roller Bearing Co., Canton, Ohio.

#### TWIST DRILLS

See Drills, Twist

#### UNIT HEATERS

L. J. Wing Mfg. Co., Linden, N. J.

#### UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wassen Ave., Springfield 7, Mass. Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

#### **VALVE CONTROLS**

Philadelphia Gear Works, (Motorized), Erie Ave. and G St., Philadelphia, Pa.

#### VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St.,
Salem, Ohio.
Rivett Lathe & Grinder Inc., Brighton, Boston
35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate,
Detroit, Mich.

#### VALVES, Hydraulic

VALYES, Hydraulic
American Steel Foundries, Elmes Engrg. Div.,
Poddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilitan Carp., Eddystone Div.,
Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, III.
Denison Engrg. Co., 1160 Dublin St., Columbus
16, Ohio.
Honnifin Corp., 501 S. Wolf Rd., Des Plaines
III.
Hunt. C. B., & Son., 1911 E. Pershins St.

Hunt, C. B., & Son., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., Meunt Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1.
N. Y.

(Continued on page 374)

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Rivett Larine & Grinder, Inc., Brighton, Boston 35, Mass, Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill. Turchan Follower Machine Co., 8259 Livernols & Alaska Aves, Detroit, Mich. Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.

#### VIBRATION INSULATION

American Felt Co., Glenville, Conn.

#### VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dole Ave., Chicago, III.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Honaifin Corp., 501 S. Wolf Rd., Des Plaines,
III. Ill.
Logansport Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2,
Mich.
US. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

#### VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffale 7, N. Y.

#### VISES, Planer and Shaper

From & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elon and Garrard Aves.,
Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, Ill.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

#### VOLTMETERS

General Electric Co., Schenectady, N. Y.

#### WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

#### WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

#### WELDING AND CUTTING EQUIPMENT Oxyacetylene

Linde Air Products Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

#### WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

#### WELDING EQUIPMENT, Electric Arc

Federal Mch. & Welder Co., Warren, Ohio. General Electric Co., Schenectady, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

#### WELDING EQUIPMENT, Electric, Spot,

Butt, Seam, Etc. Federal Mch. & Welder Co., Warren, Ohio.

#### WELDING POSITIONER

duMont Corp., Greenfield, Mass.

#### WELDMENTS

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Mahon, R. C., Co., Detroit 34, Mich. Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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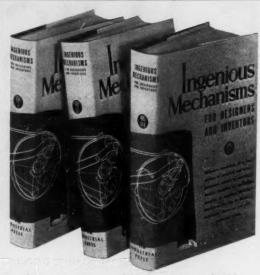
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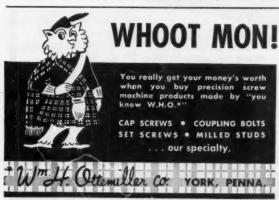




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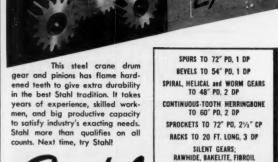
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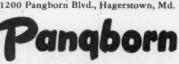
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Spurgeon Automation Unit on the test floor of the Spurgeon The rest most or the spurgeon of the state Note the vital points where Clevelands are installed—a small unit (20AT) driving the sman unit (ZUA1) ariving the feed mechanism and two 70ND units, one at each end of the elevator lift.

# Spurgeon automation unit employs three CLEVELANDS

IN a Detroit automotive plant, three Spurgeon units automatically elevate, transfer and feed steel bars into ber out of machines. Too production is gained and house bar cut-off machines. Top production is gained and hours Dar Cut-Oil machines, 10p production is gained and it. of man power and money are saved by automation.

Three Cleveland Worm Gear Speed Reducers are em-Inree Cleveland worm Gear Speed Reducers are employed on each Spurgeon unit: Two vertical reducers on the mechanical drive that Operator the alcourteer a shirt pioyed on each Spurgeon unit. 1 wo vertical reducers on the mechanical drive that operates the elevator; a third cleveland on the usy Poll Conveyor puebes the rode into the mechanical drive that operates the elevator; a third Cleveland on the "V" Roll Conveyor pushes the rods into

Automation and Cleveland Worm Gear Speed Reducers Automation and Cleveland Worm Gear Speed Reducers go hand-in-hand. Precision matching of case-hardened go hand-in-hand. Precision matching of case 100% dethe bar cut-off machine. go nand-in-nand. Frecision matching of case-naruencu steel worms to nickel-bronze gears insures 100% described by the compact right-angle Claveland steel worms to mckel-bronze gears insures 100% de-pendability. And, the compact, right-angle Cleveland

penuaumty. Anu, the compact, right-angle C design saves space and makes installation easy. Find out what Cleveland can do for your operations before you buy. Catalog 400 gives the story. The Cleveland worm and Gear Co., 3276 E. 80th St., Cleveland 4. O. Affiliate: The Farval Corporation, Centralized Systems of

mitate: The Farval Corporation, Centralized Systems ( Lubrication, In Canada: Peacock Brothers Limited.



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